the OIL AND GAS JOURNAL

AUGUST 18, 1958

★ ★ ★
NEW FEATURE
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Giant Gas Field Looms for West Texas

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HERSCHER DOME:

Working storage in spite of leaks

p. 114

Canada

A coast-to-coast appraisal of a vigorous oil dominion—where it is, and where it's going

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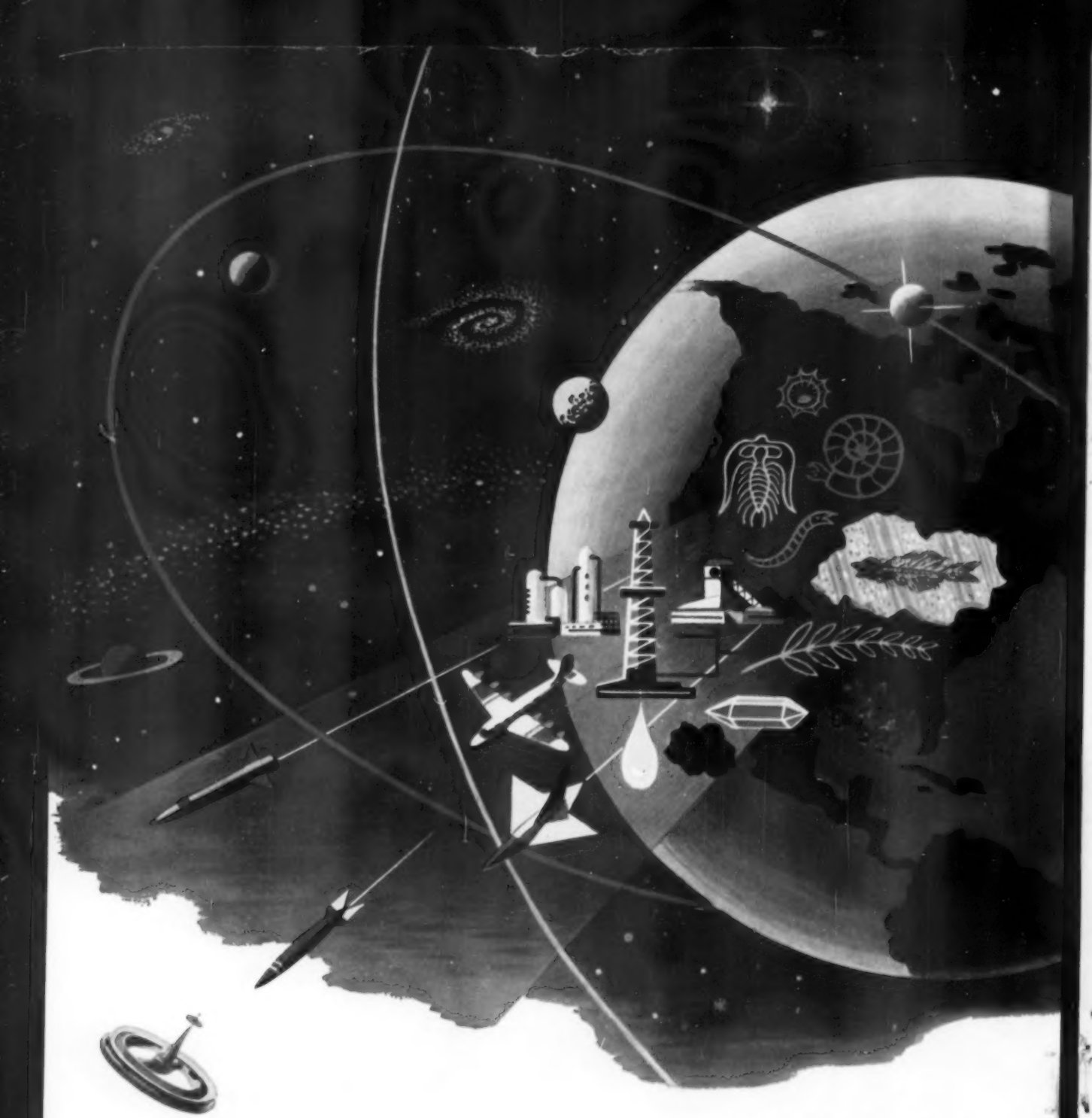

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Tulsa, Okla.
August 18, 1958

Refiners must change their yield pattern soon:

Failure to do so will mean sloppy gasoline market.

Here's situation:

Gasoline production has risen sharply in last 2 months until it's now ahead of last year.

This output is due to heavy yield of gasoline per barrel of crude run.

A good pickup in demand has helped use up much of this output, but there's still enough left over to put stocks at higher level than last year.

The danger is this:

Labor Day, marking end of big motoring season, is near. Demand will ease off.

If an early cold snap shoves up demand for heating oils, refiners will have to step up crude runs to make this product since its stocks are low.

This means they'll have to make gasoline at the same time and send it to storage. Excessive gasoline inventories will inevitably result in a sloppy market and depressed prices. In fact, the gasoline market is already showing some signs of softening.

Economists advise refiners to reduce runs and shift yield patterns to make more heating oils. They think refiners should be building up their crude inventories with the extra allowable oil now becoming available (p. 103).

Why is Jersey increasing its stock ownership in Humble? Speculation on this and earlier Jersey offers to buy International and Creole stock has been a favorite summer sport.

Some have suggested a Carter-Humble merger is being arranged. Some said Jersey was just "tidying up its corporate structure." Another explanation: Jersey thinks its cheaper to buy reserves than to spend cash to find them. Still another: It reflects increased importance on Western Hemisphere operations.

Jersey has been noncommittal. It's "good business" or "we think it's to our advantage" have been stock replies to direct questions.

More and more it looks as if Jersey's simple explanation is best. If ownership of 88% of Humble is good thing, 98% would be better.

Net income of 35 oil companies totaled $965.7 million during the first half of 1958 against $1,456.2 million during the first half 1957 for 34% drop.

That compares with 35% decline for 592 manufacturing firms, 30% for 809 manufacturing and other companies.

Oil companies' second quarter net was 15% lower than first.

Profits are harder and harder to come by.

Proof: To earn each new $1 profit after taxes, manufacturing companies now need to increase sales an average of $29. Year ago ratio was $19.

Current ratio for petroleum refining is $13, compared with $9 year ago.

That's shown by study of latest FTC profit survey.

Reasons for profit drop:

...Sales are down about 9% from year ago.

...Costs, expenses are up from 90.6% of total sales to nearly 94% of sales.

On the bright side: More straws in the wind point to continued upturn.

Rotary rigs in operation in U. S. reached 1,926 last week, highest since early February. It was a gain of 178 rigs in 2 weeks. There were 145 rigs operating in Canada.

Employment is climbing, workweeks getting a bit longer. General Motors will recall more than 100,000 hourly-rate employes to their jobs by mid-October for 1959 model change over. Income up .8% since February low. Trend is upward, so people will be buying more.

Industrial production is up .8% from April low. Manufacturers' new orders are 2.5% higher than February. New housing starts are up nearly 15% from March rate.

Outlook: Upward trend expected to strengthen.

Government will spend more. During next 6 months, U. S. treasury will pay out almost $12 billion more than it will have coming in. Local governments will step up spending in next year by $3 billion.

Forecast is for growth in business volume, improvement in profits.

Another market for U. S. crude is fading.

American oil exports to the Ontario refining district are expected to end in September. Small shipments will continue from Venezuela and Trinidad. Bulk of refiners' needs will be met by Canadian production.

Producers still are feeling effects of price adjustments.

Bell Oil & Gas Co. has increased its postings in North Texas and the Texas-Oklahoma Red River areas by 8 cents a barrel. This makes top of $3.08 a barrel.

Esso Standard Oil Co. has cut its prices by 10 to 15 cents a barrel on 92,000 bbl. daily in Louisiana and Mississippi. Reductions average out at 10.5 cents a barrel.

Increased tempo seen for North Africa's oil boom. Activity is being stepped up (p. 122).

French will spend $435 million this year on oil development. Most is earmarked for Algeria. A 24-in. line from Hassi Messaoud field to Bougie on Algerian coast is under way.

Another 24-in. line through Tunisia to Mediterranean seems a sure bet.

American, Italian interests are also active in Tunisia. Conorada's $4-million exploration program is starting, and Rimrock, with Italian partner, has entered picture.

Interest in nuclear submarine tanker is spurred by successful voyage of Nautilus under North Pole.

Undersea tanker would be preferred to dry cargo vessel since liquid cargo would tend to equalize external pressure. That would permit thinner, lighter, more economical hull.

Cost still would be over $100 million—four times more than largest surface tanker on drawing board.

Tanker freight rates for petroleum products are now at lowest level in last 10 years.

That's because of continued oversupply of tanker tonnage. At midyear tanker tonnage in lay up in world ports exceeded 6 million deadweight tons. Inactive U. S. tonnage totaled 971,000 dw. tons, five times more than year ago.

Importance of recruiting technical and professional people is pointed up by American Oil giving a title to the job. Philip E. Darling was named to new position of director of professional recruiting.

Look for more triple and quadruple completions.

Paving the way is development of successful three and four-way packers, small-diameter tubing, simplified wellheads.

Most operators think mechanical problems involved in multiple completions are offset by lower drilling costs, additional allowable.

Southland Royalty may have first Devonian discovery in southeastern Alberta in many years. Its Hays area wildcat recovered 800 ft. of clean oil at 4,100 ft. in Jefferson-Devonian. Devonian success could warm up cold trek into these rocks of western Canada (p. 262).

Mississippian hunt is gaining momentum in Utah's north-

ern Paradox basin. It's leading news item in Rocky Mountain wildcatting this summer.

Argo Oil will test Mississippian at Wayne County wildcat. Standard of California plans one on newly-approved Bert Mesa Unit in Wayne, Garfield counties.

Pure Oil has confirmed state's only Mississippian producing area at Big Flat.

And an unconfirmed strike by Cabeen Exploration spurs the hunt.

First Tensleep-Pennsylvanian oil production was opened in Wyoming's Cretaceous O'Brien Springs Unit, Carbon County. Atlantic Refining and Fremont Petroleum tested oil on drill-stem test of Tensleep at 6,900-31 ft. in 3 Unit.

New Tensleep prospect is also Dakota gas discovery. If successful it would add oil production, new-pay gas production.

Most closely watched basin in central Rockies is Green River.

Reasons: Recent discoveries, big development successes, planned increases in gas markets, big wildcat splurge.

New giant gas field may be in the cards for Texas. Brown-Bassett area may prove to be whopping 70-section field.

That's the prediction of geologists for companies active in area. They point out drilling already has proved up 10 sections of thick Ellenburger gas pay (p. 106).

The Texas-Oklahoma-Kansas area once again is a happy hunting ground for gas buyers.

Competition among half dozen existing lines and one new one has bid up wellhead prices 10 cents in last 3 years. Offering prices now are up to 23 cents an M.c.f.

One line reportedly is trying to buy gas under 200,000 acres for 1959 expansion project.

Last major legal hurdle is about to be cleared by backers of proposed 1,500-mile natural-gas pipeline from South Texas to Florida. Houston Corp.'s public financing plan is before SEC for approval.

Engineers have been trying to track down mysterious gas leaks from Herscher dome underground storage for last 5 years. Search has hit one stone wall after another.

With persistence of a "private eye" on a "hot" case, they've tried every known test, and some new ones. It's paying off.

The case isn't solved yet. But the trail is getting much warmer. Source of the baffling leak has been pinned down to small area (p. 114).

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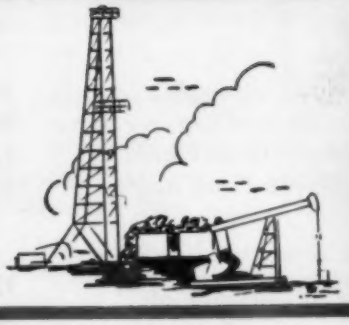

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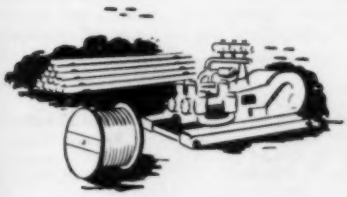

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A New Journal feature, "The JOURNAL Said . . ." It takes you back 50, 25, and 10 years ago to the days when the industry was younger and the Journal was, as it still is, reporting the fascinating story of oil. The feature appears this week on Page 111.

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SPECIAL CANADIAN REPORT

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By G. L. Gray
A wildcat success ratio of 45 to 49% has stimulated a brisk drilling and exploration program in the Peace River country, but the success so far is only a beginning.

The Wildcatter's Delight—An Undrilled Basin 136
By C. Warren Hunt
A six-well exploration campaign has begun on the Queen Charlotte Islands off the west coast of British Columbia.

Four-Section Spacing Marks a Progressive Step 141
By Norman S. Morrisey
Alberta's Oil and Gas Conservation Board has set a precedent by ordering 2,560-acre spacing in the new East Calgary gas field.

Refraction Surveys Work Well in Alberta Foothills . . . 143
By John L. Robinson
Refraction seismograph surveys are being used to good advantage in shooting for structure in the foothills belt.

Steelman Field . . . An 80-Million Barrel Stratigraphic Trap . . . 149
By J. Nesbitt
This Williston basin field produces from the Midale-Mississippian beds, and is one of the largest in a 100-mile-long trend.

Field Tests in Canada Prove a New Casing-Testing Tool . . . 161
By Larry C. M. Darling
Some operators, using the new casing-failure-elimination tool, have reported savings of $250,000 a year.

Home Oil Co. Rewards Canada With its Newest Major Oil Province . . . 169
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Photogeology Cuts Time in Mapping and Exploration in Canada . . . 179
By Paul Fuenning and Andy J. Broscoe
Compared to other mapping methods, photogeology requires less time, is less expensive, and not subject to terrain, weather problems.

Canada's Refining Capacity Soars . . . 197
By John P. O'Donnell
With half a dozen refineries building or planned, and enlargement of older ones, Canada expects to increase its processing capacity by one-third in the next few years.

Trans-Canada Pipeline Nears Completion . . . 204
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The longest pipeline in the world is rapidly approaching the final finishing stage.

Eastern Canada Bids for a Share of the Spotlight . . . 206
By J. D. McAlary and B. V. Sanford
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Blowouts Take a Fearful Toll . . . 210
By H. Donald Binney
Blowouts continue to plague the Canadian oil industry. There have been 32 blowouts since March 1948, for an average of 3.2 per year.

Maritime Provinces Offer a New Challenge 253
By William S. Shaw
After 50 years of neglect, wildcatters are taking a new look at eastern Canada's Maritimes provinces. Existence of one oil field, new lease availability, and abundant indications of oil have stimulated an unprecedented play.

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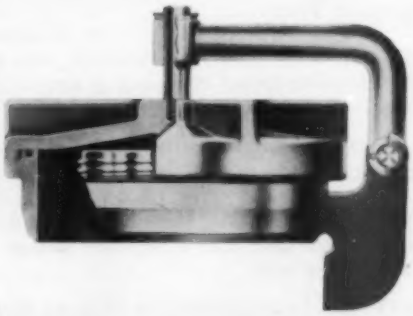

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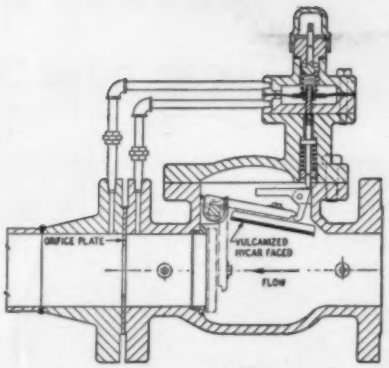

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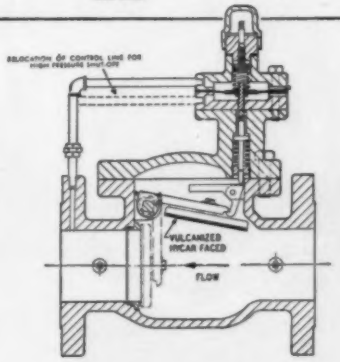

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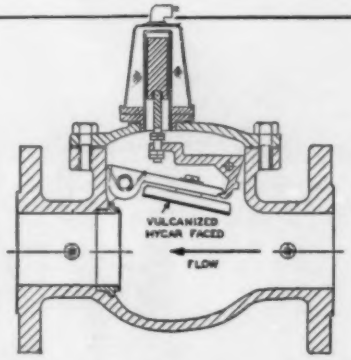

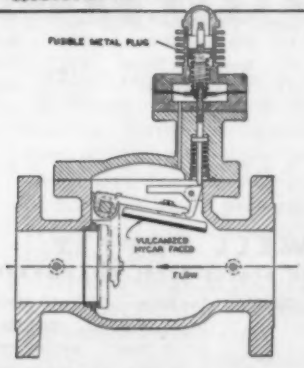

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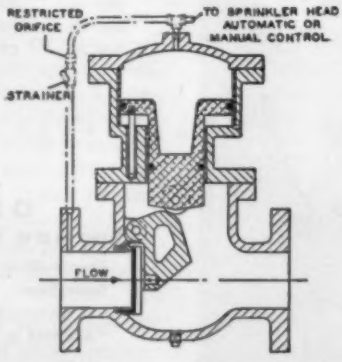

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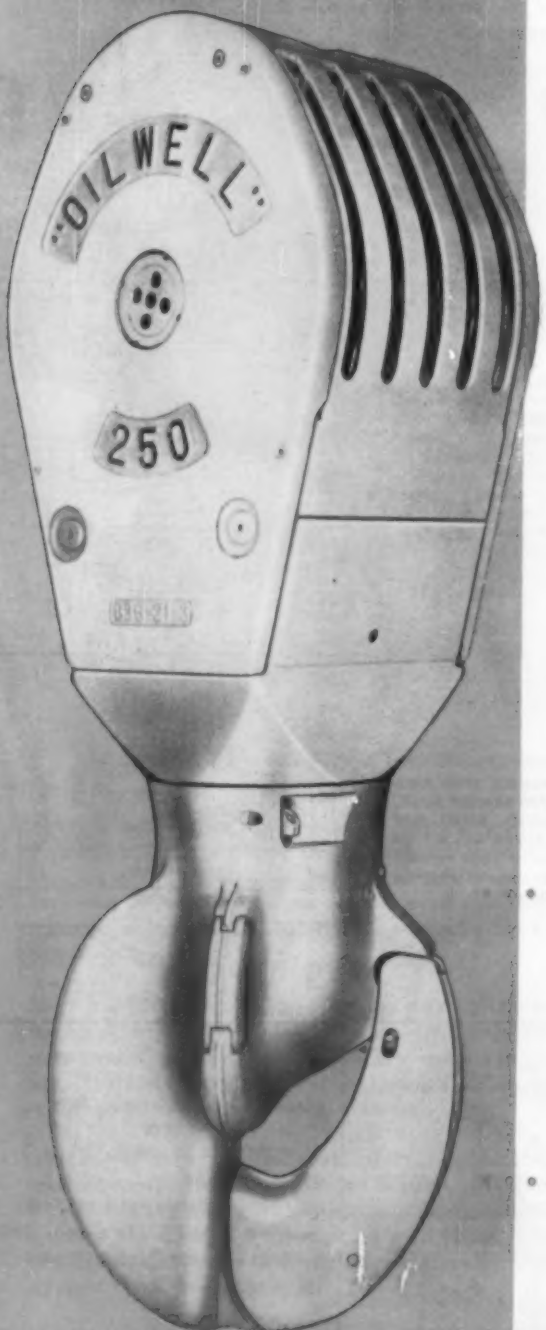

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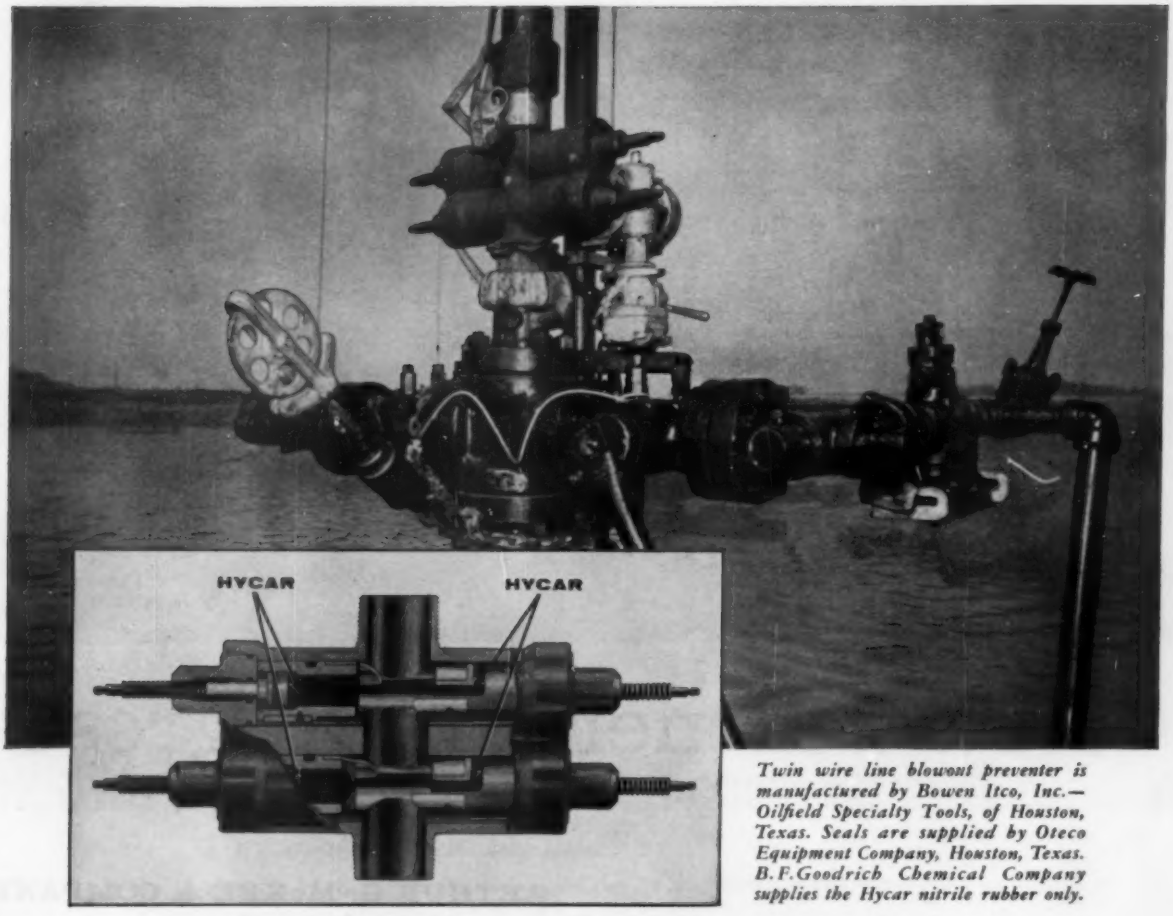

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THIS twin blowout preventer uses seals of Hycar nitrile rubber. It protects against well blowout during permanent completion operations or workovers under pressure with wire line equipment. The seal is frequently under pressures of 5,000 to 8,000 psi—and the unit calls for a perfect seal over and over again. Hycar proved ideal as a seal.

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Hycar's exceptional resistance to change in properties makes it the choice for many applications where there are tough operating conditions.

You can get more information by writing Dept. KC-5, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, O. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

Hycar
American Rubber

B.F.Goodrich Chemical Company
a division of The B.F.Goodrich Company

B.F.Goodrich

GEON polyvinyl materials • HYCAR American rubber and latex
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JOIN IN AN OVERSEAS WORKING AGREEMENT

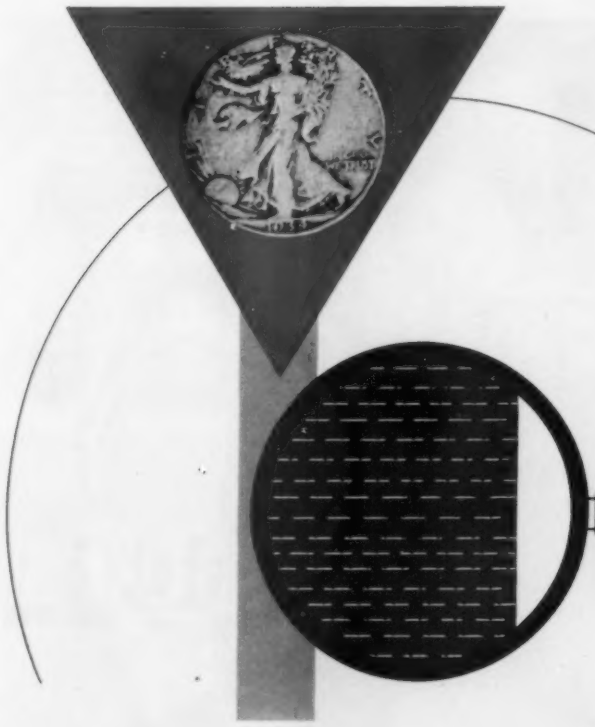
Now the combined skills, resources and extensive experience of these two internationally renowned organizations are linked in a progressive world-wide working association. These skills can be applied to your overseas petroleum refinery or chemical plant projects on a *single contract* basis!

The McKee-Raymond working team assures the utmost in efficient, comprehensive services and offers the ability to handle the entire job ... preliminary studies, design, engineering, purchasing and construction.

So if you're planning a petroleum or chemical project in Asia, Africa, Australia, New Zealand or South America, investigate the advantages of using McKee-Raymond. Write either Raymond International Inc., 140 Cedar St., New York 6, N.Y. or Arthur G. McKee & Co., 2300 Chester Ave., Cleveland, Ohio.

McKEE·RAYMOND

OVERSEAS ENGINEERING AND CONSTRUCTION SERVICES



PROFITABLE PRODUCTION IMPROVEMENT

with HALLIBURTON'S SAND-WATER

SAFER, SENSIBLE AND SATISFACTORY FRACTURING TREATMENT

Halliburton's Sand-Water makes available to you three important advantages for getting more from your well through formation fracturing.

- It is economical, since it uses fresh or salt water or inexpensive oil field brines as the base fluid.
- It is safer because it is non-combustible.
- It is effective. Where conditions indicate its application, it has stimulated production effectively in both oil and gas wells.

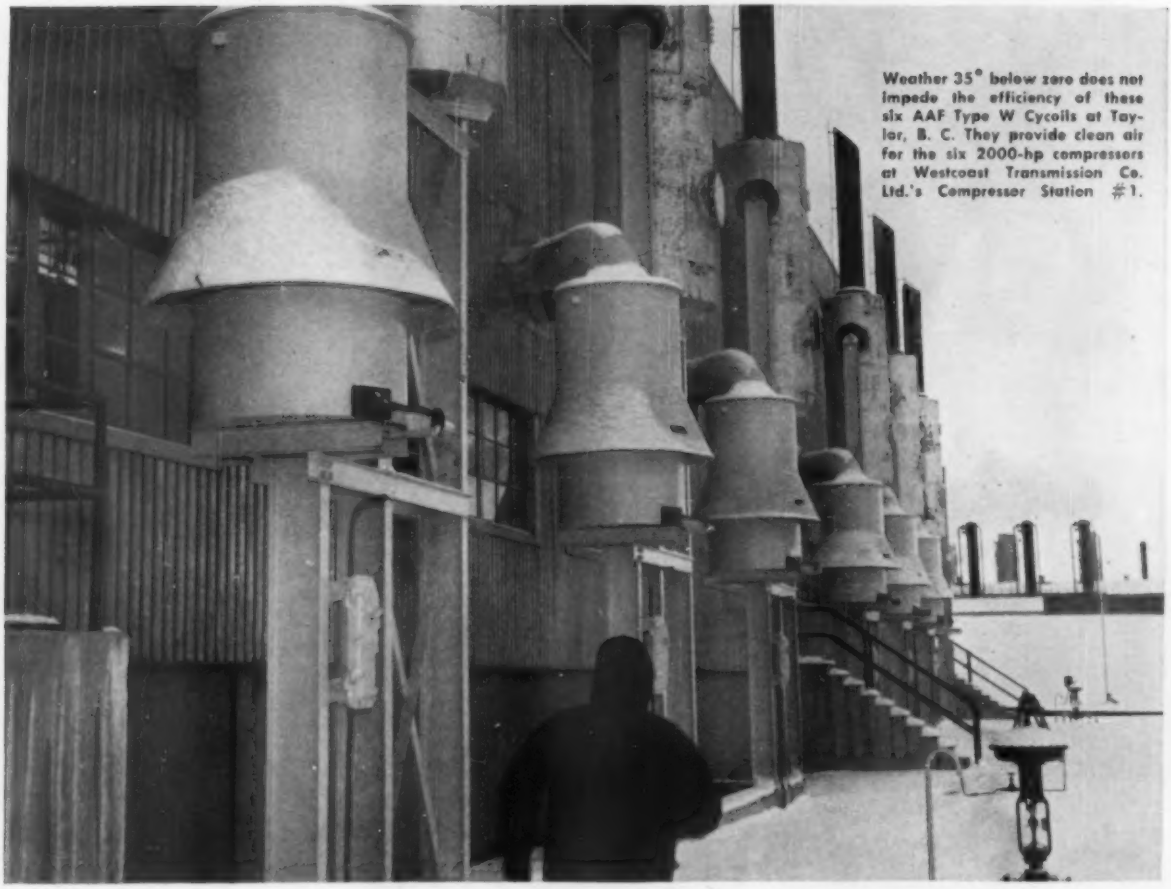
While the fluid loss characteristic of Sand-Water is normally high, it may be substantially reduced by Halliburton's specially formulated WLC-1. Other Halliburton additives may be incorporated for surface tension reduction, non-emulsification, and clay swelling inhibition.

Investigate the benefits of Sand-Water; check its advantages against the fracturing requirements of your well. Your local Halliburton Representative will be glad to give you specific details of its application.

HALLIBURTON FRACTURING SERVICES

HALLIBURTON OIL WELL CEMENTING COMPANY • DUNCAN, OKLAHOMA

FOR RESEARCH AND RESULTS IN FORMATION FRACTURING



Weather 35° below zero does not impede the efficiency of these six AAF Type W Cycoils at Taylor, B. C. They provide clean air for the six 2000-hp compressors at Westcoast Transmission Co. Ltd.'s Compressor Station #1.

COLD ... but CLEAN ... CYCOIL air helps power Canada's Big Inch

Westcoast Transmission Co., Ltd.'s Compressor Station #1—initiating station of Canada's new seven-station, 17-compressor, 52,500-hp Big Inch Line—is the northernmost complex of its kind in the western hemisphere. Here British Columbia "sour" gas is "sweetened", compressed, and started on its journey toward the U. S. border, more than 750 miles away.

Despite bitter cold, AAF Type W Cycoil oil-bath intake air filters efficiently and uninterruptedly provide clean air for the safe operation of six 2000-hp gas engines. The only concession to the cold—which sometimes reaches 50 below zero—is the use of Arctic-type oil!

Whether your operation is in the frozen north, a temperate region, or a hot and dusty desert . . . whether the application is pulsating action or smooth flow, packaged or stationary units, automatic station or not . . . AAF has filters *engineered* to match your requirements. For complete information, call your nearest AAF representative; or, write direct for Bulletin 130.

Type CMS Multi-Duty Filters

Type G Pipeline Air Filters

AAF herman nelson

American Air Filter

COMPANY, INC.

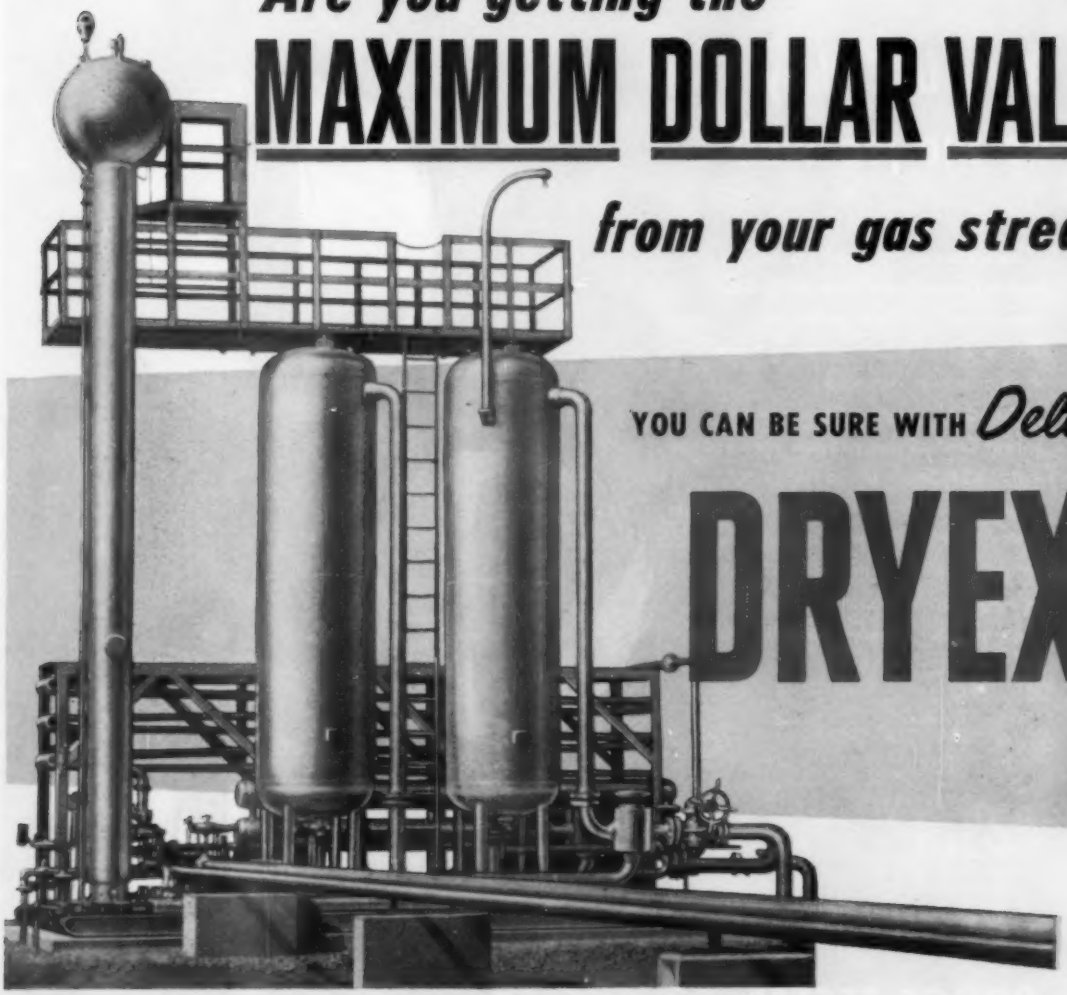
444 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

BETTER AIR IS OUR BUSINESS

Type OCH Intake Air Filters

Cycoil Oil Bath Air Filters

Are you getting the
MAXIMUM DOLLAR VALUE
from your gas stream?



YOU CAN BE SURE WITH *Delta*

DRYEX®

DE2-8

An adsorption process unit — tailored to your requirements

It's impossible to get maximum profits from your gas stream if you give away certain liquids that can now be recovered by DRYEX. A product of Delta Tank Manufacturing Co., DRYEX is a reliable, efficient unit for dehydration and gasoline extraction from relatively small and lean gas streams. It is a rapid-cycle, fully-automatic, self-contained, skid-mounted unit, already proven in actual lease operation. Let us analyze your gas stream to determine the value of the Delta DRYEX Unit to you. For complete technical information, contact your local Mid-Continent representative.

Mid-Continent Supply Co. is exclusive distributor world wide of Delta oil field equipment.

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. . . BECAUSE they must do the job well

Based on established standards, Larkin Centralizers take 45% less permanent set than maximum . . . exert 300% more initial centering force than minimum required.

Based on field performance, Larkin Centralizers provide convenience of installation, ease of starting, maximum centering force and minimum permanent set. There's a size and range for every condition. Specify Larkin Centralizers . . . through your supply store.

LARKIN CASING CENTRALIZERS ARE DESIGNED AND PROOF-TESTED TO EXCEED ANY KNOWN STANDARD FOR CENTRALIZER PERFORMANCE

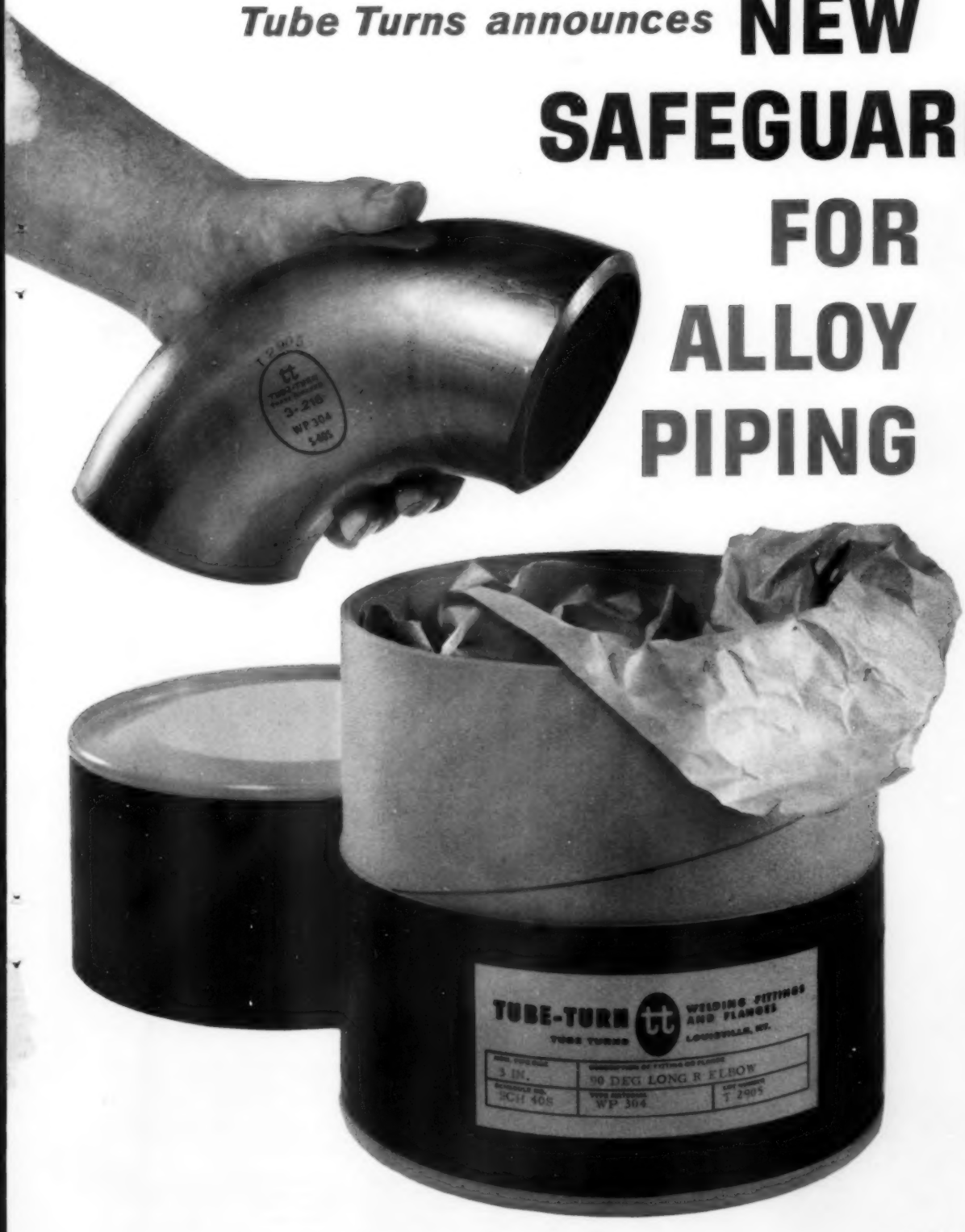
LARKIN PACKER COMPANY, INC.
WAXAHACHIE, TEXAS

LARKIN
...Through Your Supply Store

PESA

LARKIN LEADERSHIP HAS BEEN EARNED BY YEARS OF DEPENDABLE PERFORMANCE

Tube Turns announces **NEW SAFEGUARD FOR ALLOY PIPING**



For details, turn the page... →

NOW...individual packaging protects each TUBE-TURN® Alloy Welding Fitting and Flange

AVAILABLE IN...

STAINLESS STEELS	COPPER
ALUMINUM ALLOYS	SILICON BRONZE
NICKEL	RED BRASS
MONEL	ADMIRALTY METAL
INCONEL	TITANIUM
HASTELLOY B & C	ZIRCONIUM
	ZIRCALOY

...and other non-ferrous metals and alloys

MAIL FOR BULLETINS
on TUBE-TURN Alloy Fittings and Flanges

TUBE TURNS
224 E. Broadway, Louisville 1, Kentucky
Please send me bulletins on these fittings and flanges:
☐ Alloys ☐ Stainless Steel ☐ Aluminum
Company Name _____
Company Address _____
Your Name _____
Position _____
City _____ Zone ____ State _____

Your nearby Tube Turns' Distributor can supply your fitting needs in alloys and non-ferrous metals . . . as well as in carbon steel, wrought iron, carbon-moly and chrome-moly. This one source for all your requirements in welding fittings and flanges enables you to simplify purchasing and cut red tape.

Tube Turns is now safeguarding the top quality of its stainless steel, aluminum and other alloy products with individual packaging. All of these fittings in sizes through 12", and flanges through 8", are now wrapped in kraft paper and individually packaged in a rugged container, built to standards established by extensive testing. Hence, from point of rigid inspection to job site, *each* fitting is *protected* against damage.

Here is new *convenience*, too. Your fittings are easier to store. And each container is fully marked with description of fitting or flange, size, schedule, type material and production lot for positive, easy identification in the warehouse or on the job.

Here is another plus value you get when you specify TUBE-TURN* Alloy Fittings and Flanges, and buy them from your nearby Tube Turns' Distributor.

The trademarks "TUBE-TURN" and "tt" are applicable only to the quality products of Tube Turns.

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DIVISION OF CHEMETRON CORPORATION
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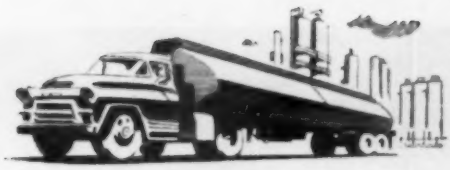
CHEMETRON



Want to get there Quicker, Safer, at Lower Cost?

Eaton 2-Speed Axles Will Do It!

Eaton 2-Speed Axle trucks make quicker, full-load trips—with no sacrifice of power when it's needed to pull out of the tough spots. But they do more than save time; they save money, too. With double the conventional number of gear ratios right at their finger tips, drivers use the *right* gear ratio for every operating condition. This lets engines operate in their most efficient and economical speed range; stress and wear are reduced right down the line from the engine to the axle itself. Operating and maintenance costs are cut to the bone. And through improved maneuverability and reduced driver fatigue, Eaton 2-Speed Axle trucks make not only *quicker* trips but *safer* ones. They haul more at lower cost per mile, last longer, and are worth more when traded in.

More than Two Million Eaton Axles in Trucks Today. For complete information, see your truck dealer.

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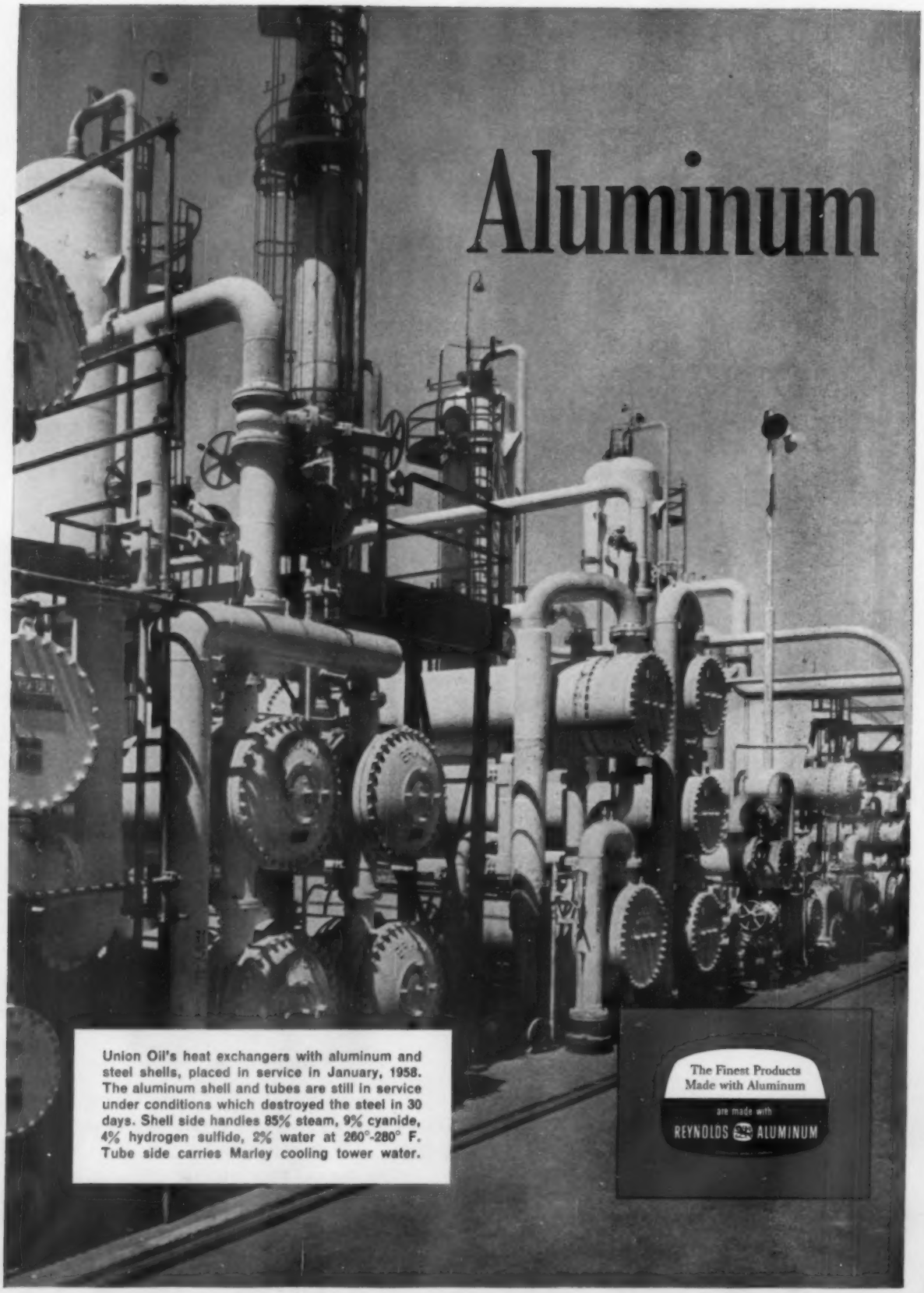
PRODUCTS: Engine Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Hydraulic Pumps Motor Truck Axles • Permanent Mold Gray Iron Castings • Forgings • Heater-Defroster Units • Automotive Air Conditioning Fastening Devices • Cold Drawn Steel • Stampings • Gears • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers


Aluminum
Union Oil's heat exchangers with aluminum and steel shells, placed in service in January, 1958. The aluminum shell and tubes are still in service under conditions which destroyed the steel in 30 days. Shell side handles 85% steam, 9% cyanide, 4% hydrogen sulfide, 2% water at 260°-280° F. Tube side carries Marley cooling tower water.
The Finest Products Made with Aluminum
are made with
REYNOLDS ALUMINUM

Heat Exchangers Last Longer...

up to 7 times longer for Union Oil

Union Oil Company of California is converting several of its shell and tube heat exchangers—and parts of these exchangers—to Reynolds Aluminum. Main reason: aluminum lasts longer in many heat exchanger applications, up to 7 times longer.

For example, in Union's heat exchangers which handle waste water from a refinery cat tower, steel condenser tubes lasted only a few weeks before corrosion made them useless. Aluminum tubes, now in the same service, last 7 times as long handling the same corrosive fluids.

In the same application, steel tube sheet and baffles lasted about 5 months before they had to be replaced. Union engineers replaced these with aluminum and installed aluminum bundles in January, 1957. They are still in service.

The bare tubes of Union's heat exchangers are Reynolds Aluminum alloy 3003-H14, and the tube sheets and baffles are 6061-T6.

Union Oil's aluminum heat exchangers really save in service cost. On a dollars per square foot of heat transfer area per year base, aluminum units are nearly *5 times lower in cost* than the same units with seamless mild steel. This does not include handling costs, which favor lightweight aluminum.

Initial cost, incidentally, is virtually the same for aluminum and steel in these uses.

Heat exchangers are just one of many places Reynolds Aluminum is cutting costs in this industry. Its resistance to corrosion, its passivity, light weight and strength make aluminum *the* logical material for tanks, vessels, jacketing, piping, tubing, and other applications where corrosives must be handled or stored.

To learn how aluminum can cut your costs, write the people who know aluminum and its uses in the chemical and petroleum industry—*Reynolds Metals Company, P.O. Box 2346-CR, Richmond 18, Virginia.* Or contact your local Reynolds branch office, listed under "Aluminum" in the classified phone book.

Write today for Reynolds free bulletins—
"Aluminum for Heat Exchangers" and "Keys to Corrosion".

REYNOLDS ALUMINUM

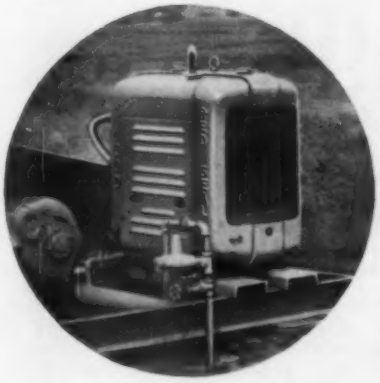
Watch Reynolds All-Family Television Program, "DISNEYLAND", ABC-TV.

Standardize on

CONTINENTAL RED SEALS

for

Performance - Economy - Long Life



Continental performance—economy—long life are bywords in the oil fields—wherever power is used. Today's line of Red Seal engines—for use on all standard fuels—is up to the minute mechanically—broader and more diversified than ever before. They are engineered and built to the specialized needs of an almost endless list of industrial and oil field applications . . . See your oil field supply store or write the factory for information.

Continental Motors Corporation

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Coming to Houston? Put yourself in our hands. In our Oil & Gas Department is a complete office—reserved for you. After you arrive in our new banking quarters, we provide telephone and secretarial service, arrange conferences and make available any of our four conference rooms. Let us know when you're coming. *We'll* do the rest.

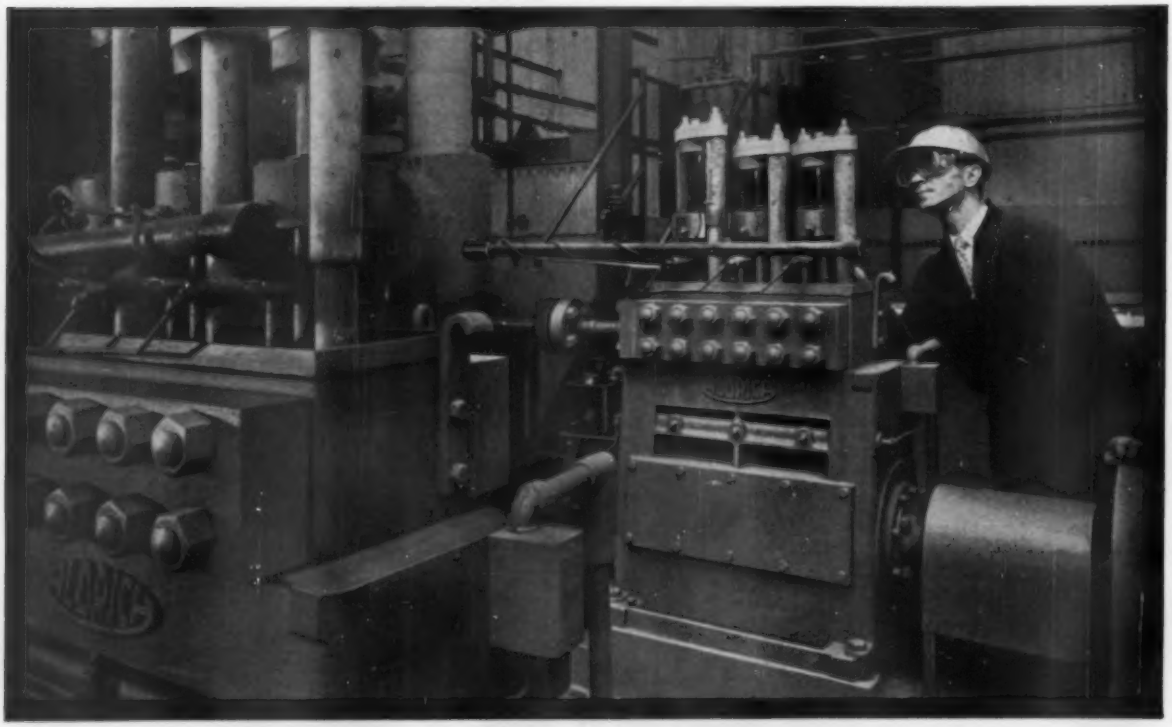
BANK OF THE SOUTHWEST, HOUSTON

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

SPENCER CHEMICAL CO. UNRAVELS KNOTTY PROBLEM:

Maintaining a controlled flow of liquid ammonia at high pressures, 24 hours a day.

At the Vicksburg, Miss. plant of Spencer Chemical Company, ammonia production demands two things of pumps: (1) 24-hour, 7-day-week operation and (2) continuous flow of controlled volumes of liquid ammonia at high pressure.

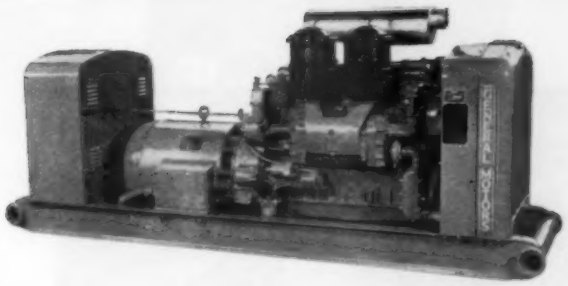


How Spencer licked the problem: When Spencer began outlining construction plans in 1951, company engineers specified two Aldrich Direct Flow, ¾" x 3" stroke Triplex Pumps. These were scheduled to be used for alternate 30-day periods. According to company spokesmen, nearly four years of service have proved these pumps to be efficient and capable of durable service.

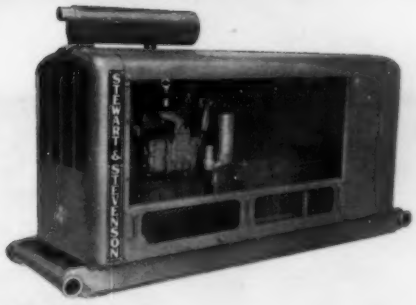
Results: Dependability and freedom from trouble in all phases of operation. The Vicksburg Works Maintenance Superintendent tells us: "The Aldrich Pump is an excellent unit. Valve life is excellent and packing life exceptionally good."

We'll be glad to send you full information on Aldrich Pumps and their advantages to you. Simply write Aldrich Pump Company, 9 Gordon Street, Allentown, Pa.

the toughest pumping problems go to ALDRICH



OPEN TYPE



CLOSED TYPE

From the world's most experienced producers of

ENGINE GENERATOR SETS

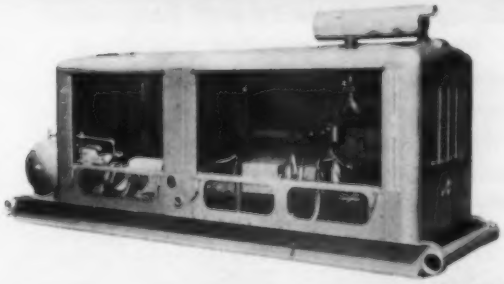
1500 Watts to 1000 Kilowatts

TRAILER MOUNTED

STEWART & STEVENSON

Stewart & Stevenson provides the most complete range of performance-proved engine generator sets. Combination Oil Field Utility Units, Rig Lighting Plants, A.C. Units, D.C. Units, heat exchanger cooled, radiator cooled, portable or stationary, explosion proof, standard type or custom built for any need.

Select the kind of power you prefer—Diesel, Natural Gas or LPG. Call, write or wire today for complete information on your engine generator set requirements.



UTILITY UNIT

STEWART & STEVENSON SERVICES, INC.

Main Office and Plant: 4516 Harrisburg Blvd.,
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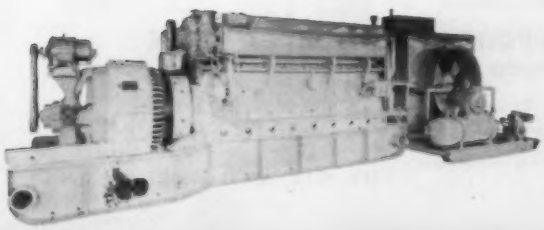
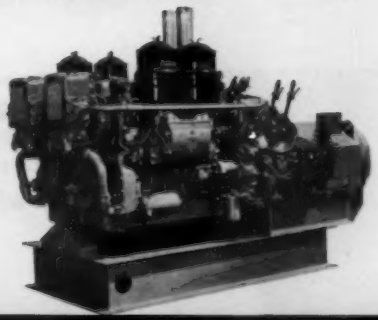
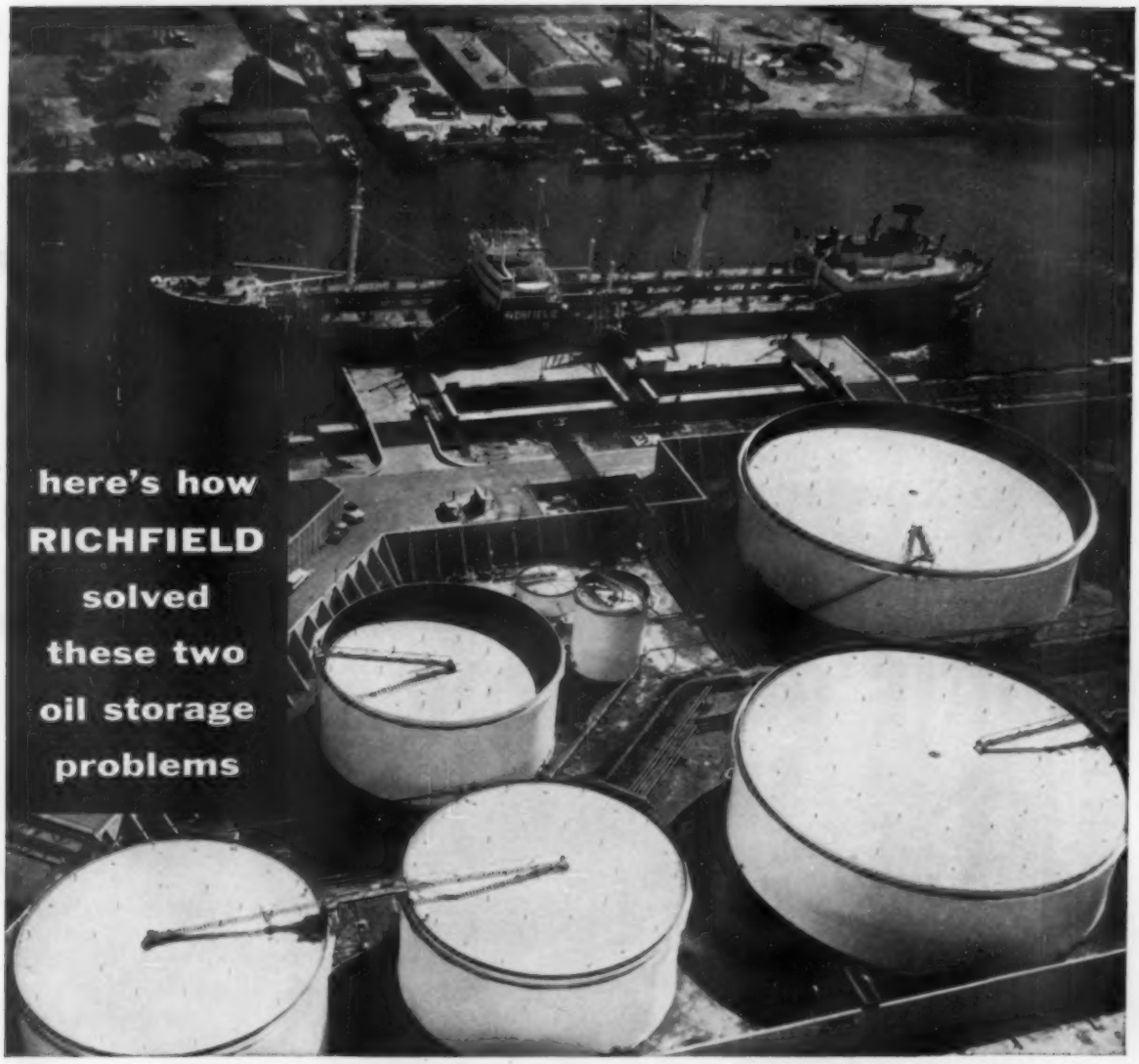
THE WORLD'S LARGEST DISTRIBUTOR OF DIESEL ENGINES

450 KW SKID MOUNTED



HEAT EXCHANGER TYPE





1. Fire Hazard 2. Vapor Loss

Here is an investment by Richfield Oil Company that pays off in safety and conservation. It is a seven-tank addition to Richfield's Marine Terminals that adds half a million barrels capacity. The tanks, built by General American, are equipped with Wiggins Floating Roofs with Wiggins Safety Seal that stops vapor loss and protects from rim fires.

Wiggins Double-Deck Floating Roofs with the Wiggins Safety Seal, reduce vapor space under the circumferential fabric to an absolute minimum. This practically eliminates losses due to thermal breathing and serves to prevent rim fires. The fabric is of a new, long-lived type and a special weather-hood protects it from the sun. The seal mechanism is always out of the liquid and the corrosive vapor space. Only the Wiggins Safety Seal gives you all these advantages.

PLATE & WELDING DIVISION
GENERAL AMERICAN
TRADE MARK

PLATE & WELDING DIVISION
GENERAL AMERICAN TRANSPORTATION CORPORATION
135 South LaSalle Street, Chicago 90, Illinois
Offices in all principal cities
It pays to plan with General American

Buying Heat Exchanger Tube?

If you are, then naturally you're looking for top value for your tubing dollars. That's exactly what you'll get when you specify heat exchanger tubes made the Tubemanship way by Wolverine. You can specify both prime surface tubing or Wolverine Trufin®—the integrally finned heat exchanger tube that boosts shell side heat transfer surface in both condensers and heat exchangers. Each is available in a wide range of types, alloys and sizes. Wolverine Tube's complete heat exchanger tube lineup is pictured on the following two pages. Look them over, and then specify the type—or types—you need. You'll find that because of Tubemanship—***there is a difference in tubing.***

CALUMET & HECLA, INC.
CALUMET DIVISION
URANIUM DIVISION
GOODMAN LUMBER DIVISION
WOLVERINE TUBE DIVISION

In Canada:
CALUMET & HECLA OF CANADA LIMITED
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WOLVERINE TUBE
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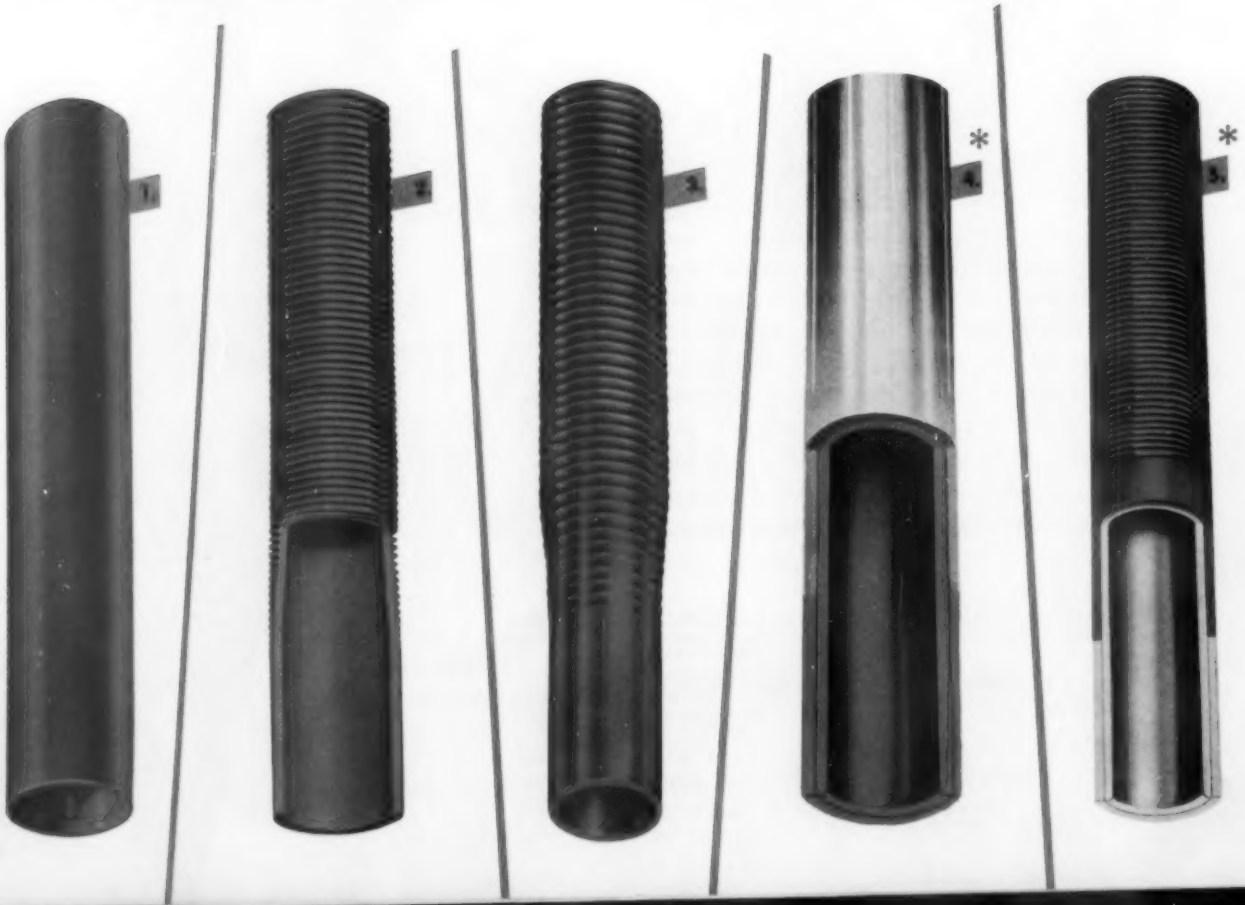
Manufacturers of Quality-Controlled Tubing and Extruded Aluminum Shapes

PLANTS IN DETROIT, MICHIGAN AND DECATUR, ALABAMA
SALES OFFICES IN PRINCIPAL CITIES

EXPORT DEPT. 13 E. 40TH ST., NEW YORK 16, N.Y.

WOLVERINE MAKES ALL THESE TUBES

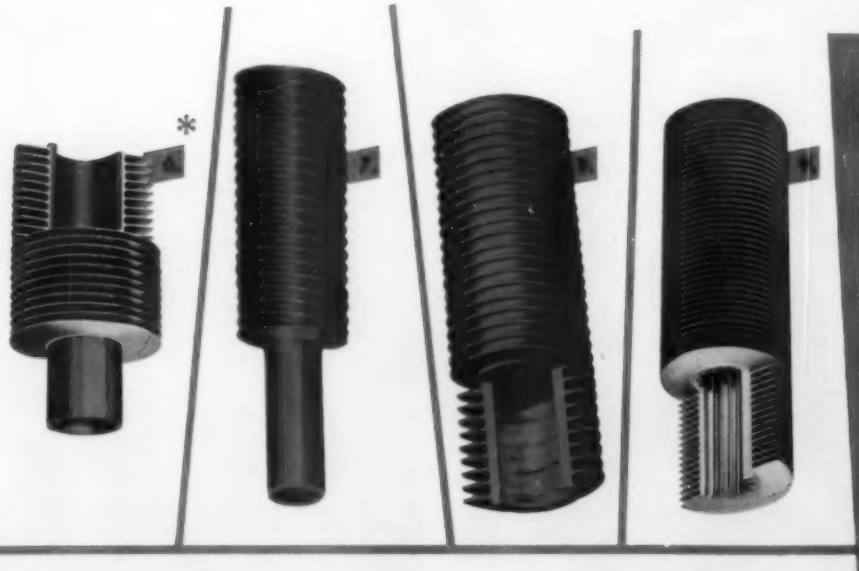


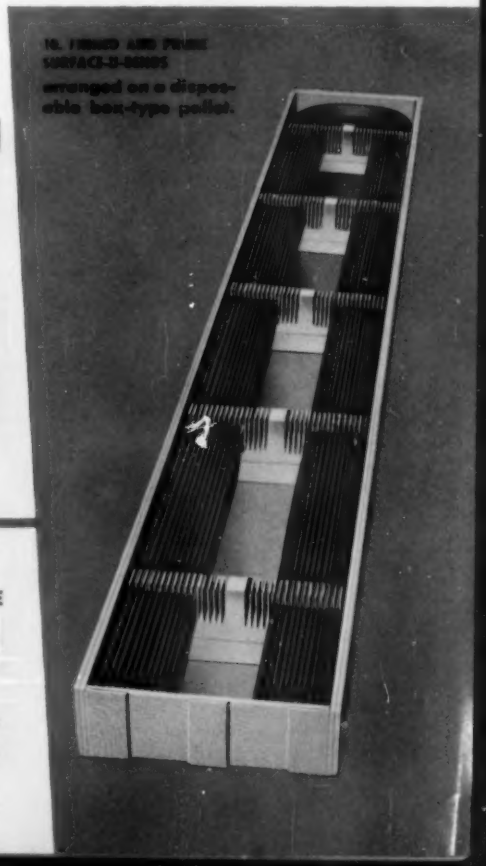
...FOR HEAT EXCHANGE
...FOR CONDENSING

1. PRIME SURFACE TUBE
2. WOLVERINE TRUFIN TYPE S/T
3. WOLVERINE TRUFIN TYPE W/H
4. PRIME SURFACE TUBE—Bi-Metal
5. WOLVERINE TRUFIN—Bi-Metal
6. WOLVERINE TRUFIN TYPE L/C—Bi-Metal
7. WOLVERINE TRUFIN TYPE H/R
8. WOLVERINE TRUFIN TYPE H/A
9. WOLVERINE TRUFIN TYPE I/L

Wolverine Tube believes that to serve an industry well you must know its problems. That's why it maintains an extensive research and development program—from which has come the wide range of heat exchanger tubes illustrated below. From these you can choose tubing that will successfully withstand corrosive attack . . . boost heat transfer capacity . . . or eliminate (with U-Bend tubes) the fabrication and handling problems encountered when working with condenser tubes over 30 feet in length. Any one you specify will serve you well.

Wolverine Trufin is available in Canada through the Unifin Tube Division, London, Ontario.





10. FINNED AND PRIME SURFACE Bi-Metals arranged on a disposable box-type pallet.

* *Now!* BOND-RESISTANCE TESTING FOR BI-METAL TUBE

A new Wolverine Heat Transfer Tester has been developed which accurately measures ***bond-resistance*** of Wolverine Trufin Type L/C and other bi-metal tubes.

Exhaustive tests during manufacture have shown bond resistances of Type L/C to be negligible. This is another step by Wolverine to insure your receiving the highest tubular quality.

FREE ENGINEERING HELP

Skilled engineering help—from men who know tubing and how it can serve you most advantageously—is instantly available to Wolverine customers. If you have a problem concerning heat transfer, corrosion, type of tube to use or what have you—don't hesitate—just call on Wolverine's Field Engineering Service. There is no obligation.

AS NEAR AS YOUR TELEPHONE

Wolverine sales offices are maintained in many cities throughout the United States. You'll find the names and addresses listed in the yellow pages of your telephone directory.

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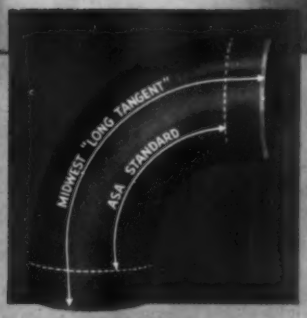
A familiar sight around gas pumping stations

One of six new semi-automatic gathering stations of the Northern Natural Gas Company that have Midwest "Long Tangent" Elbows ... and other Midwest Welding Fittings.

MIDWEST "LONG TANGENT" ELBOWS

Midwest "Long Tangent" Welding Elbows are "a natural"... their many benefits for the user are today so generally recognized that you see them wherever you go. For all the facts, ask your Midwest Welding Fittings Distributor (or write us) for a copy of Catalog 54.



ADVANTAGES OF MIDWEST "LONG TANGENT" ELBOWS

- They save pipe.
- They often eliminate short nipples and their extra welds.
- They save time and money in lining up and clamping pipe and fitting.
- They make it easier to apply slip-on flanges.
- They remove the circumferential weld from point of maximum stress and can be sleeved.
- THEY COST NO MORE THAN OTHER ELBOWS.

MIDWEST PIPING COMPANY, INC.
Main Offices
St. Louis 3, Missouri (P.O. Box 433)
Plants:
St. Louis, Clifton, N. J. and Los Angeles

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LOS ANGELES 33—320 Anderson St. • MIAMI 34—2103 La Jeune Rd
NEW YORK 7—50 Church St. • ATLANTA 9—72 11th St., N. E.
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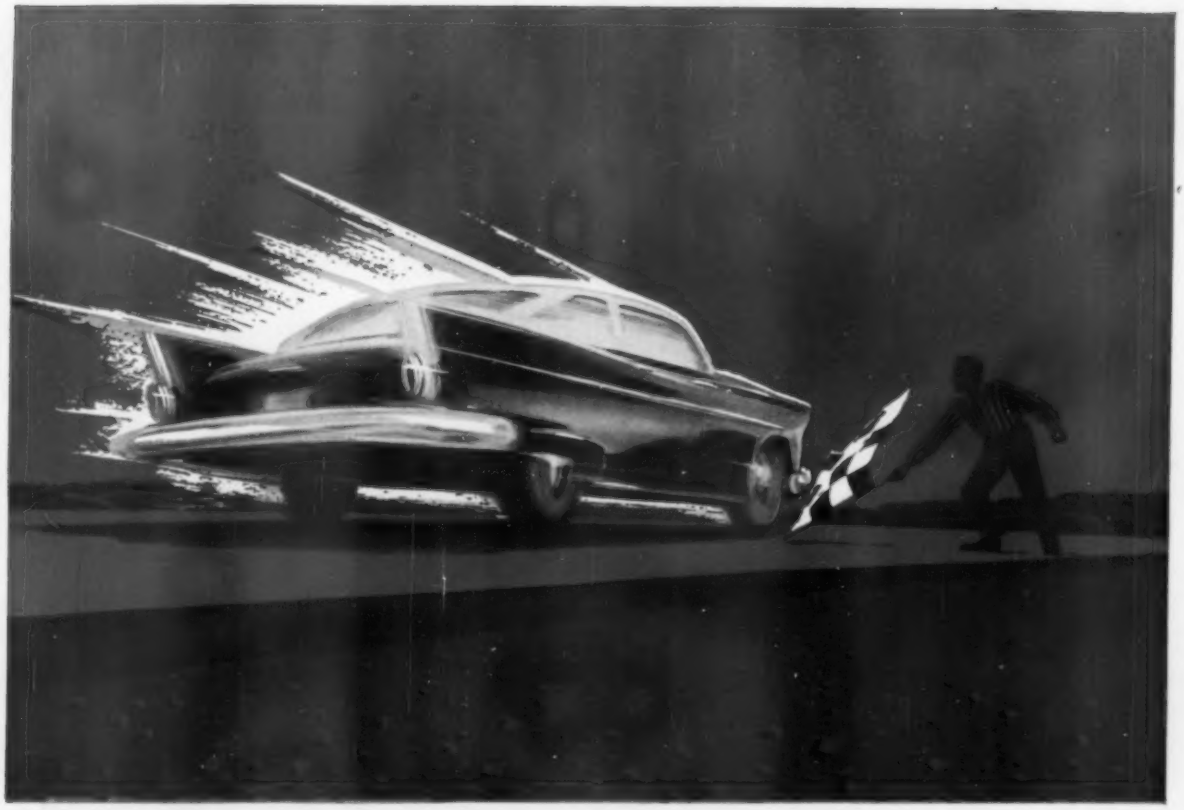
MIDWEST WELDING FITTINGS IMPROVE PIPING DESIGN AND REDUCE COSTS



For those new, higher compression engines...
a new Catforming catalyst

The trend to higher compression engines is here to stay. And wide-awake refiners have to produce fuels to suit these up-to-the-minute engines.

Atlantic is proud to offer an advanced Catforming catalyst designed to economically produce higher octane gasolines . . . *and it can be utilized in your present equipment.* For more information, write, wire or call The Atlantic Refining Company, P. O. Box 8138, Philadelphia 1, Pennsylvania.

Higher gasoline octanes through Pentafining

You can convert the low-quality n-paraffins (C_5, C_6, C_7) in your gasoline pool to high octanes! Pentafining, the process developed by The Atlantic Refining Company, makes it possible. For full particulars, write today to The Atlantic Refining Company, P. O. Box 8138, Philadelphia 1, Pennsylvania.

It's the CATALYST that counts

ATLANTIC

POWERFUL . . . PORTABLE

Bethlehem lightweight rigs make plenty of hole . . . and they're easy to move

For the contractor who requires lightweight, highly portable rigs with abundant power, Bethlehem recommends its S-45-E or its C-50.

The S-45-E, smaller of the two, is designed for shallow drilling (conventional or slim-hole) and for medium well-service and workover jobs.

The C-50 is used primarily for shallow-to-medium conventional drilling and deeper slim-hole drilling. It can be furnished with one-, two-, or three-engine drive and with or without pump drive.

Both rigs are equipped with hydraulic torque-converters for smooth, flexible, shock-free operation. Both are so compact that they can easily be trailer-mounted—a practical arrangement that gives them complete and instant mobility. Write for details.

ENGINEERING DATA

	S-45-E	C-50
Recommended input hp (engine)	300	450
Brake rim diam and width, in.	36 x 7½	42 x 8⅜
Arc of brake lining contact, degrees	330	330
Brake cooling, type	Spray	Full-flow
Length of drum spool, in.	40	41 11/16
Diam drum spool, (grooved for 1-in. line)	14 23/32	16 23/32
Low-speed drum clutch, torque capacity, ft-lb	16,800	31,280
High-speed drum clutch, torque capacity, ft-lb	8,400	31,280
Diam drum shaft, in.	5	6½
Lubrication:		
Bearings	Grease-packed	Grease-packed
Chains	Flood-oiled	Flood-oiled
Upper drum assembly	Optional	Optional

BETHLEHEM SUPPLY COMPANY
General Offices: 21 E. Second St., Tulsa, Okla.
West Coast Headquarters: Los Angeles, Calif.
Canadian Distributor: Bethlehem Supply Company of Canada, Ltd., Calgary, Alberta, Canada
Export Office: Bethlehem Supply Company (Export Division), 25 Broadway, New York, N. Y.

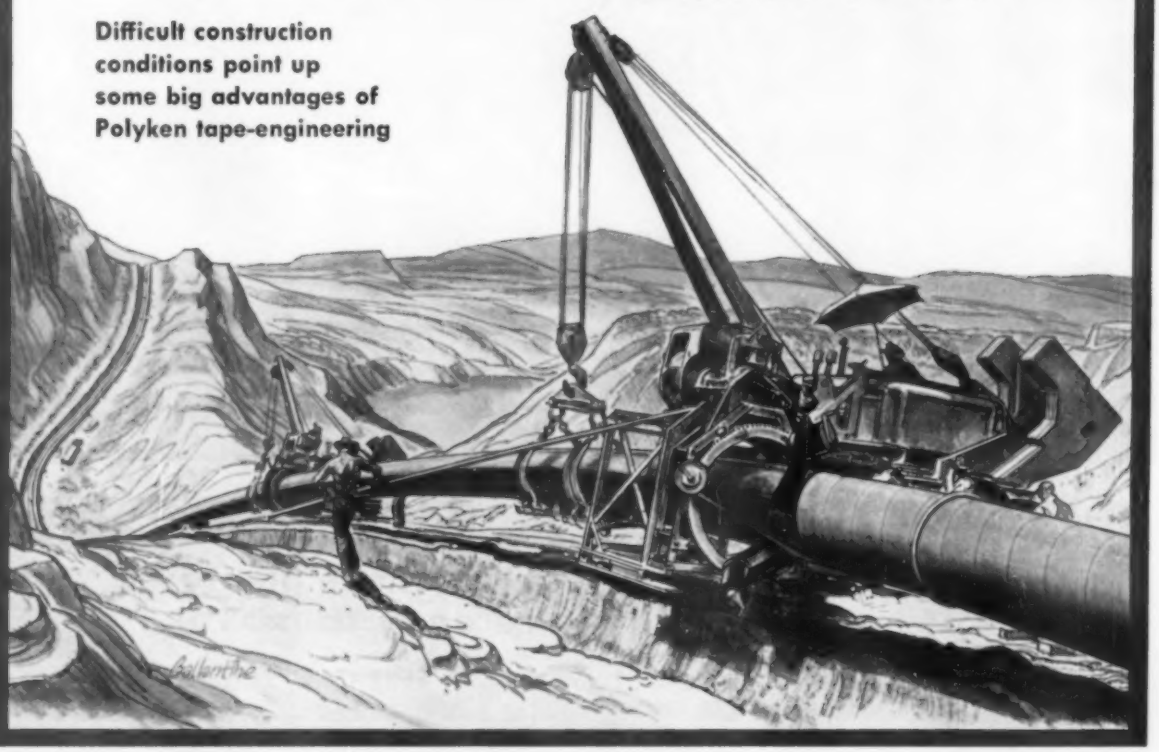
BETHLEHEM STEEL

BETHLEHEM SUPPLY

Why do Canadian spreads coat with Polyken tape?

(the proven polyethylene tape)

Difficult construction conditions point up some big advantages of Polyken tape-engineering



Canadian pipeliners have learned their business the hard way. That's why many have turned to Polyken tape and Polyken know-how—for proven results like these:

1. Substantial labor and equipment savings due to simplified operation.

2. Faster construction—consistent high daily output.

3. No hot dope preparation—tape is always ready.

4. No drying or cooling time. Simple clean-wrap-and-lower operation makes for a tight spread and closer supervision.

5. Vastly reduced warehousing, shipping, handling costs.

6. Liabilities virtually eliminated—no fumes, no burns, no need to worry about human and livestock hazards.

7. Wrap goes into ground in factory-uniform condition.

Today, considering the construction economies regularly reported, you just can't afford to overlook the Polyken method.

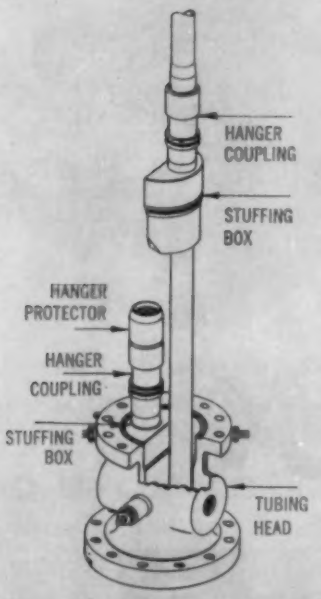
Polyken®

Experienced in modern PROTECTIVE COATING

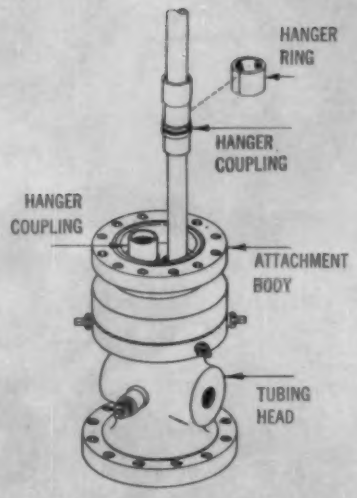
THE KENDALL COMPANY
Polyken Sales Division

If you would like to know more about proven *Polyken protection, contact Polyken Sales Division, Dept. OG8, 309 W. Jackson Blvd., Chicago 6, Ill.*

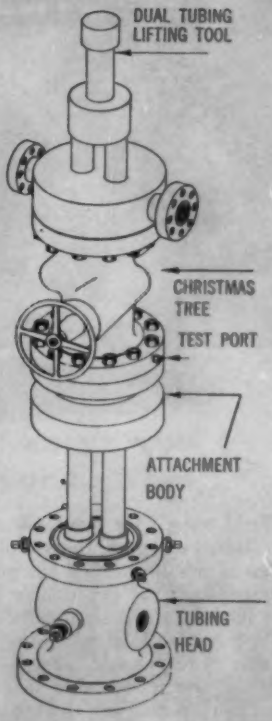
NOW--SAFE, COMPLETE CONTROL AT ALL TIMES



1. Stuffing boxes and tubing hangers are landed in the O-C-T Universal Tubing Head. Well is protected by Otis Back Pressure Valves. Stuffing boxes are used in place of dual hangers in the O-C-T Universal Tubing Head.



2. Hanger is lowered into the attachment and landing joint removed. Both strings are now hung.



3. After mud is circulated out of tubing and both zones are in, tubing is lowered and attachment body is flanged up and tested. If workover is necessary, well may be killed by lifting tubing and circulating mud.

THE NEW O-C-T "U-65" TUBING HANGER ALLOWS BOTH STRINGS OF TUBING TO BE RAISED SIMULTANEOUSLY AT COMPLETION

The new O-C-T U-65 Dual Tubing Hanger Assembly makes it possible to bring in or to kill both zones of a dual completion simultaneously under full pressure control and without down-hole circulating valves. The U-65 works efficiently with all types of packers, any combination of packers, and including hydraulic packers.
Ask your O-C-T representative for full information.
This is another in an entire group of revolutionary new developments by O-C-T. Watch for more!

where progress is a daily practice

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Address Export Inquiries for All Countries to
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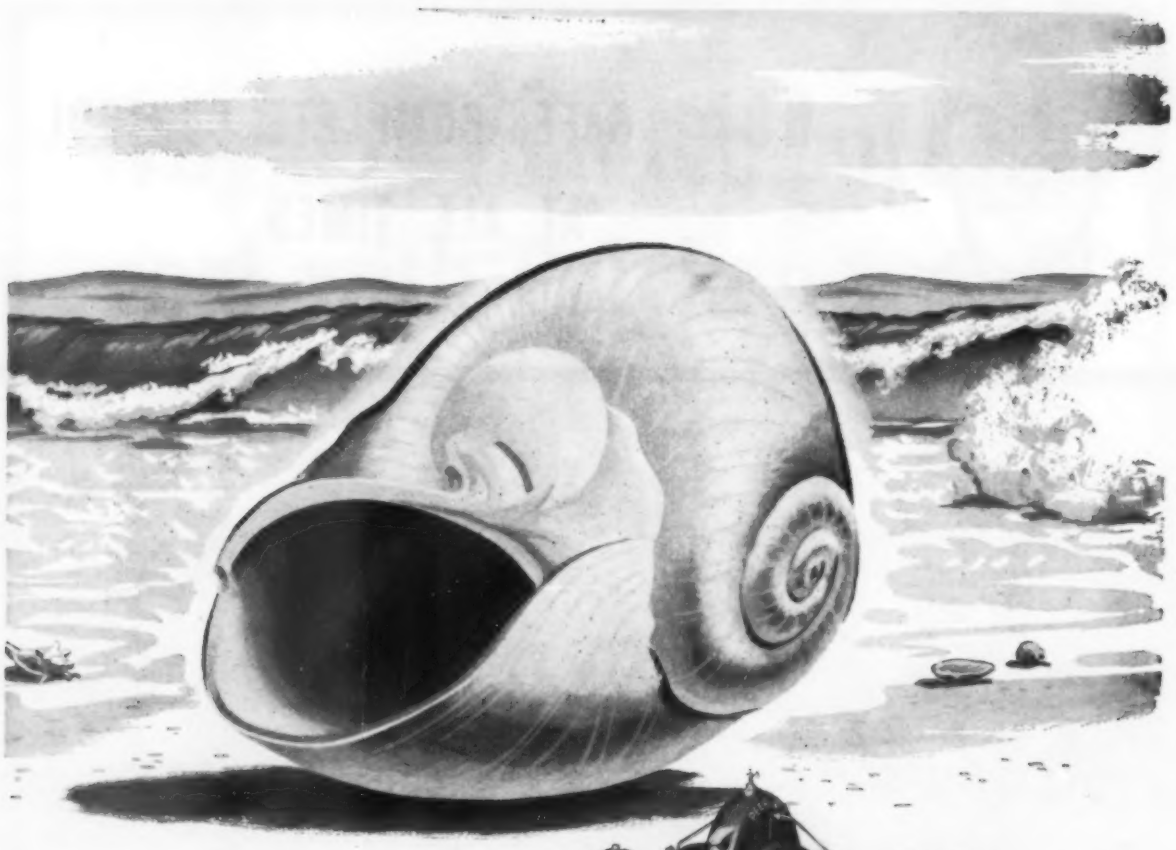

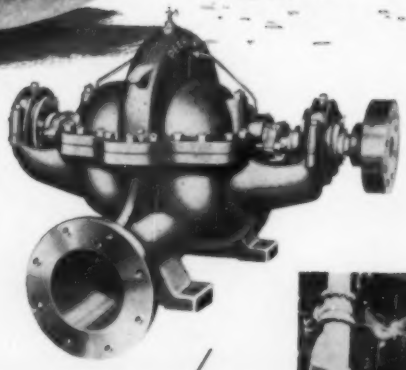

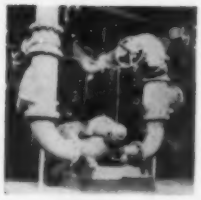

"Field tested" for thousands, perhaps millions, of years, the simplicity of design of this sea shell has proved its practicability as dependable housing. In its field, the design of the Peerless Type A horizontal split-case pump is quite as remarkable. The split at the center line allows easy maintenance without disturbing the piping. The rotating element lifts out as a unit for inspection or repair. Mechanically and hydraulically, the quality and operation of this pump is unsurpassed — *it is the type of pump you can apply with absolute confidence to general purpose pumping duties in the broadest sense.* An added advantage: the Type A pump line is the broadest offered by any manufacturer.

REQUEST BULLETIN NO. B-1300.

design / application

PEERLESS PUMPS

Putting Ideas to Work

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Peerless Pump Division

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Offices: New York; Cleveland; Chicago; St. Louis; San Francisco; Atlanta; Plainview; Lubbock; Phoenix; Albuquerque; Los Angeles; Fresno. **Distributors in Principal Cities.** Consult your telephone directory.

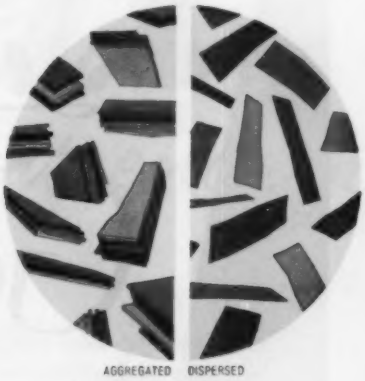
Seeing is believing . . .

Q-BROXIN*

controls flow properties *in drilling mud*

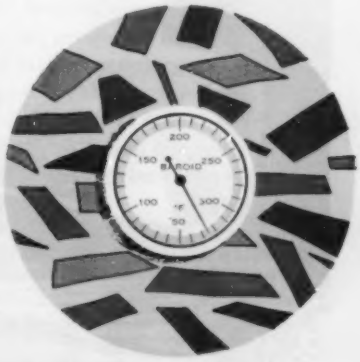
RESISTS ANHYDRITE CONTAMINATION

OVERCOMES EFFECTS OF SALT WATER



KEEPS MUD DEFLOCCULATED

Q-BROXIN'S effectiveness in reducing viscosity and gels in salt, gyp or fresh water mud is unique among mud thinners. This unique property has led to widespread use of **Q-BROXIN** for compounding aggregated muds with a filtrate that inhibits the swelling of clays and shales. In these and other types of mud **Q-BROXIN** has a surprising capacity to reduce filtration. You can hold down mud drilling costs when you specify **Q-BROXIN** —*and* Baroid know-how.

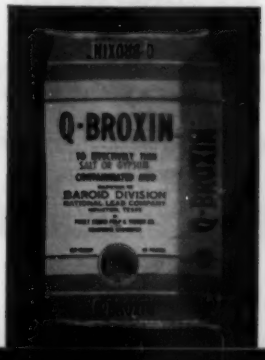


KEEPS MUD STABLE AT HIGH TEMPERATURE

BAROID

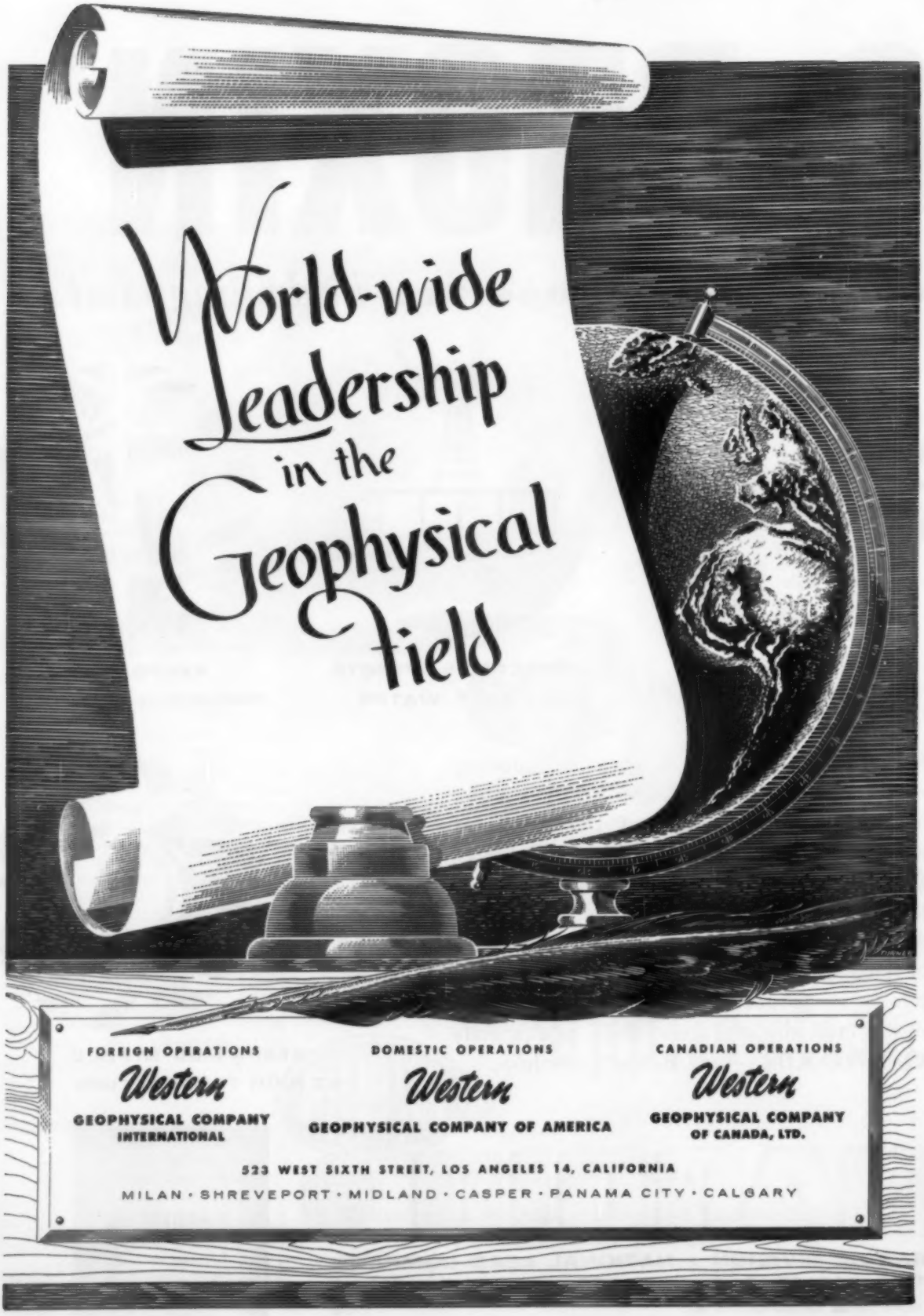
BAROID DIVISION • NATIONAL LEAD COMPANY

MAIN OFFICE: P. O. BOX 1675, HOUSTON 1, TEXAS



* Registered Trademark, Puget Sound Pulp & Timber Co.

B 5810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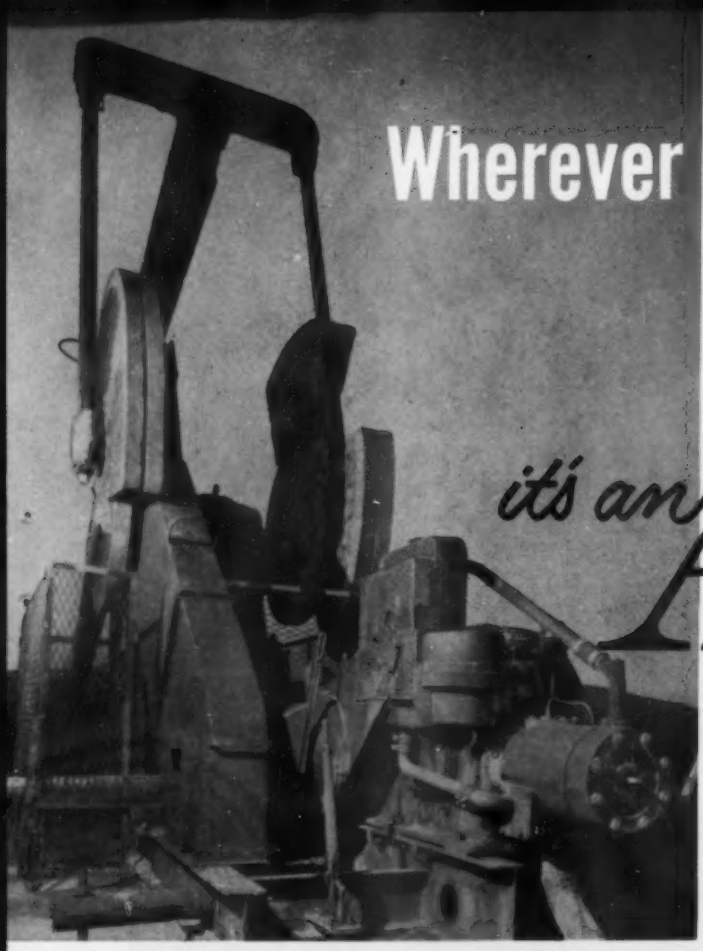

Wherever GAS ENGINES spin...

if it's willing,
able and
everlastingly dependable

it's an **Ajax** *right enough*

AJAX GAS ENGINES offer the outstanding combination of precisely-engineered simplicity, quality manufacture, smooth performance and long continuous operating life . . . in the industry's most complete gas engine line.

Eight engine sizes, ranging from 12 to 115 usable horsepower, bracket every engine power requirement of the oil producer. In every model, you get the economy *topping any other prime mover* that pays for the engine time after time throughout its useful life.

You can be sure you're "right enough"—when you specify AJAX. See your Supply Man!

Ajax

IRON WORKS

Builders of GAS AND OIL ENGINES, PRESSURE PUMPS, STEAM ENGINES

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AN ANNOUNCEMENT OF INTEREST TO THE PETROLEUM INDUSTRY

Patent No. 2,833,638 has been issued to Servco for SERVCOLOY cutting and hard-facing material

This remarkable new down-hole milling process, originated by Servco and covered by structure and method claims, will soon be available by license through other selected manufacturers and service companies.

The phenomenally-fast milling rates possible with Servcoloy resulted in its immediate acceptance for all types of down-hole milling. Jobs which previously required days to do are now being accomplished in hours. For example, milling rates on N-80 casing will average *four to five feet per hour* when Servcoloy-dressed Pilot Mills are used. This compares to rates of *three to six inches per hour* when tool steel cutters are used.

The secret to these phenomenal results is a unique method of suspending hundreds of small chunks of carbide in a tough, elastic matrix. As chunks are worn or torn away, new chunks with fresh cutting edges are automatically exposed.

Servcoloy's widespread success has spawned numerous imitations. Unfortunately, results in some instances, because of the use of inferior materials and lack of knowledge of proper manufacturing techniques, have been disappointing, reflecting adversely upon the Servcoloy process. Issuance of the patent disproves the statement frequently heard, "all carbide hard-facing materials are the same." Techniques of manufacture, method of application, and use of Servcoloy result in a superior product with a proven record of superior performance.

We assume you will desire to use the patented invention. Therefore your patience pending selection of additional sources of supply will be appreciated.

SERVCO

General Offices: 2440 Cerritos Ave., Long Beach 6, California
Gulf Coast and Mid-Continent: 4850 Gasmer Ave., Houston 35, Texas
Field Offices: Ventura, Bakersfield, Lafayette, Harvey, Oklahoma City
Canada: 5710 103A Street, Edmonton, Alberta
Venezuela: c/o A-Z Export Co., Maracaibo
Export Agent: International Tool and Supply Co., 45 Rockefeller Plaza, New York 20, New York

All Servco milling tools are available with Servcoloy

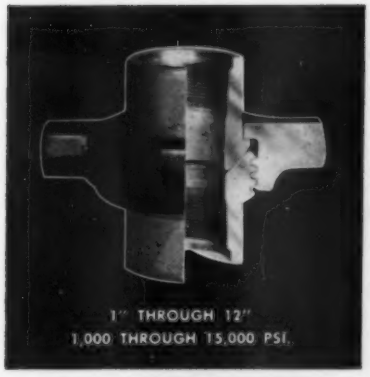
Pilot Mill

Section Mill

Taper Mill

Rotary Shoes

Junk Mills



Sold by
Supply Stores Everywhere.

"Yes, **WECO** Helped Us Cut Costs"

"You know, we really save a lot, using WECO Unions on all our rigs. We rig-up faster and spud-in quicker after moving on location. It also helps cut rig down-time because with WECO Unions we can shift equipment from rig to rig with no time lost in matching unions.

"We can get WECO Unions anywhere, too . . . that sure keeps us from having to tie-up money in spares. Not that we need replacements very often, WECO Unions seem to last forever. And those perfectly matched seats seal under all conditions, too."

Ask your WECO Representative how you can cut rig costs by standardizing with WECO Unions.

U-7-58

WECO®

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Division of CHIKSAN COMPANY *a subsidiary of*
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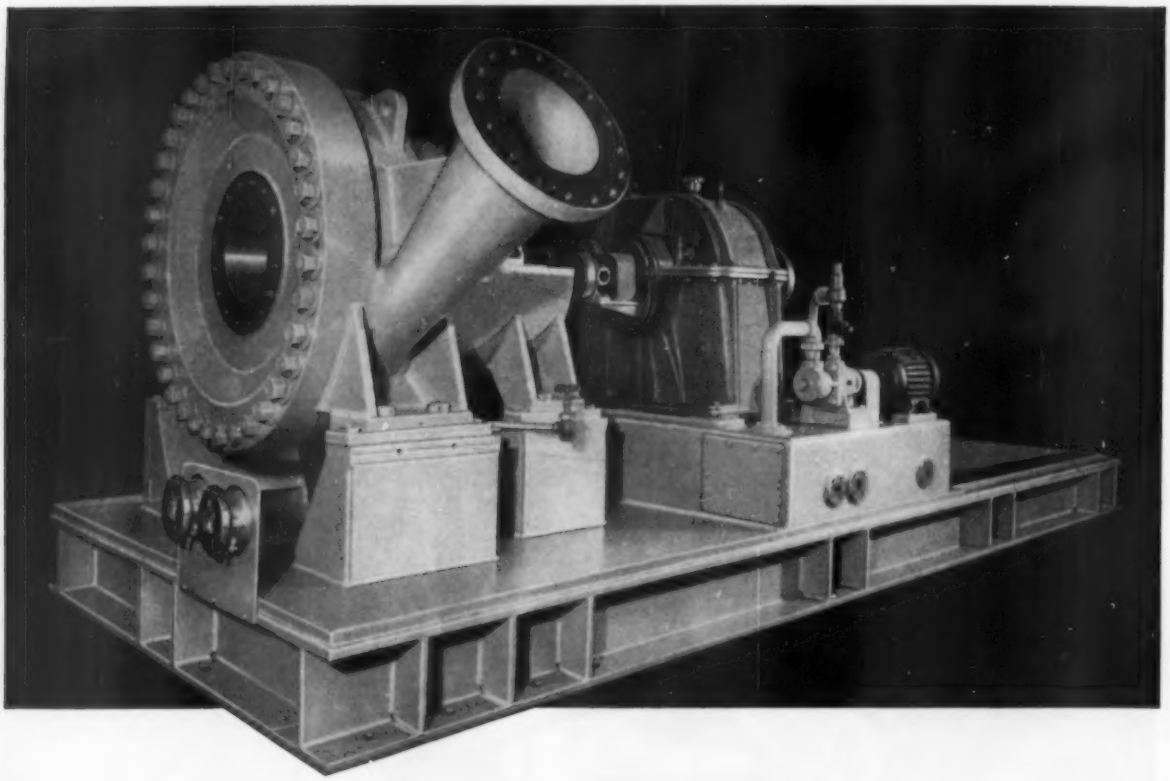


NEW

Single-Stage Barrel-Type
Allis-Chalmers Compressor

Boosts High Pressure Gas to Higher Pressure Levels in Range of 50 to 500 psia.

THIS new Allis-Chalmers development extends the range of single-stage compressors into high pressure levels previously handled by reciprocating type units.

The new compressor has all the advantages of a centrifugal compressor — compactness, pulsation-free operation, few wearing parts, easy maintenance.

The unit shown above, now in successful operation, boosts 3690 cfm of air from an inlet pressure of 185 psia to a discharge pressure of 240 psia. It is driven through a speed-up gear by an Allis-Chalmers 1250-hp motor.

The casing consists of three principal parts: the casing cylinder, a bolted casing head and a fabricated casing pedestal. A diaphragm which forms the gas diffuser passage is inserted into the casing cylinder. Excellent gas sealing is assured, since there is only one shaft extension and only one casing joint to seal against gas pressure.

For details, including a sectional view of this new compressor, call your nearby A-C representative, or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

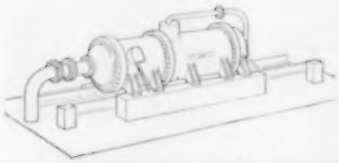
A-5728

More than 477,000 horsepower of

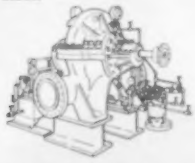
CENTRIFUGAL COMPRESSORS

for NATURAL GAS SERVICE

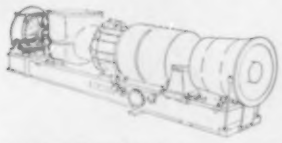
I-R *"FIRSTS"* in Centrifugal Gas Compressor History



FIRST CENTRIFUGAL PIPE-LINE COMPRESSOR Built by Ingersoll-Rand in 1931, this centrifugal pipe-line booster consists of a six-stage compressor driven by a 3550 rpm, 3000 hp motor, all encased in a pressure vessel.

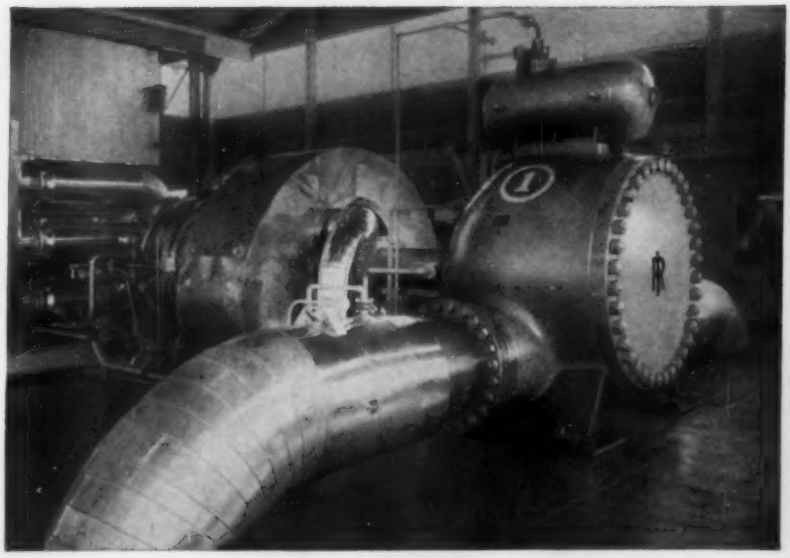


FIRST COMMERCIAL APPLICATION of centrifugal pipe-line compressors was made in 1947. A total of 78 electric-motor-driven, single-stage I-R centrifugals were installed, to handle approximately 250 mmcfd.



FIRST GAS-TURBINE-DRIVEN UNIT Installed in 1949, this Ingersoll-Rand centrifugal compressor, powered by an 1850 hp simple cycle combustion gas turbine, was the first gas-turbine-driven centrifugal compressor developed and applied to pipe-line service, and was designed for a flow of 192 mmcfd at a ratio of 1.18.

FIRST 2000 PSI CENTRIFUGAL GAS COMPRESSOR This Ingersoll-Rand 5000 hp double-case centrifugal compressor was the first unit ever built for handling natural gas at a discharge pressure of 2000 psi.



One of 12 Ingersoll-Rand centrifugal compressors on a large natural gas pipe-line.

This experience means MAXIMUM DEPENDABILITY in modern pipe-line service

FROM the very first pipe-line installation, Ingersoll-Rand has pioneered in the development of centrifugal gas compressors for higher and higher capacities and pressures. And every step of the way, dependability of performance has been a prime consideration in every detail of design and construction. This is why more I-R Centrifugal Compressors have been sold for natural gas service than any other make . . . . a total exceeding 477,000 hp for this service alone.

Backed by such long and successful experience, the modern I-R centrifugal gas compressor is your best assurance of trouble-free performance and long-range economy in gas transmission service.

Ingersoll-Rand

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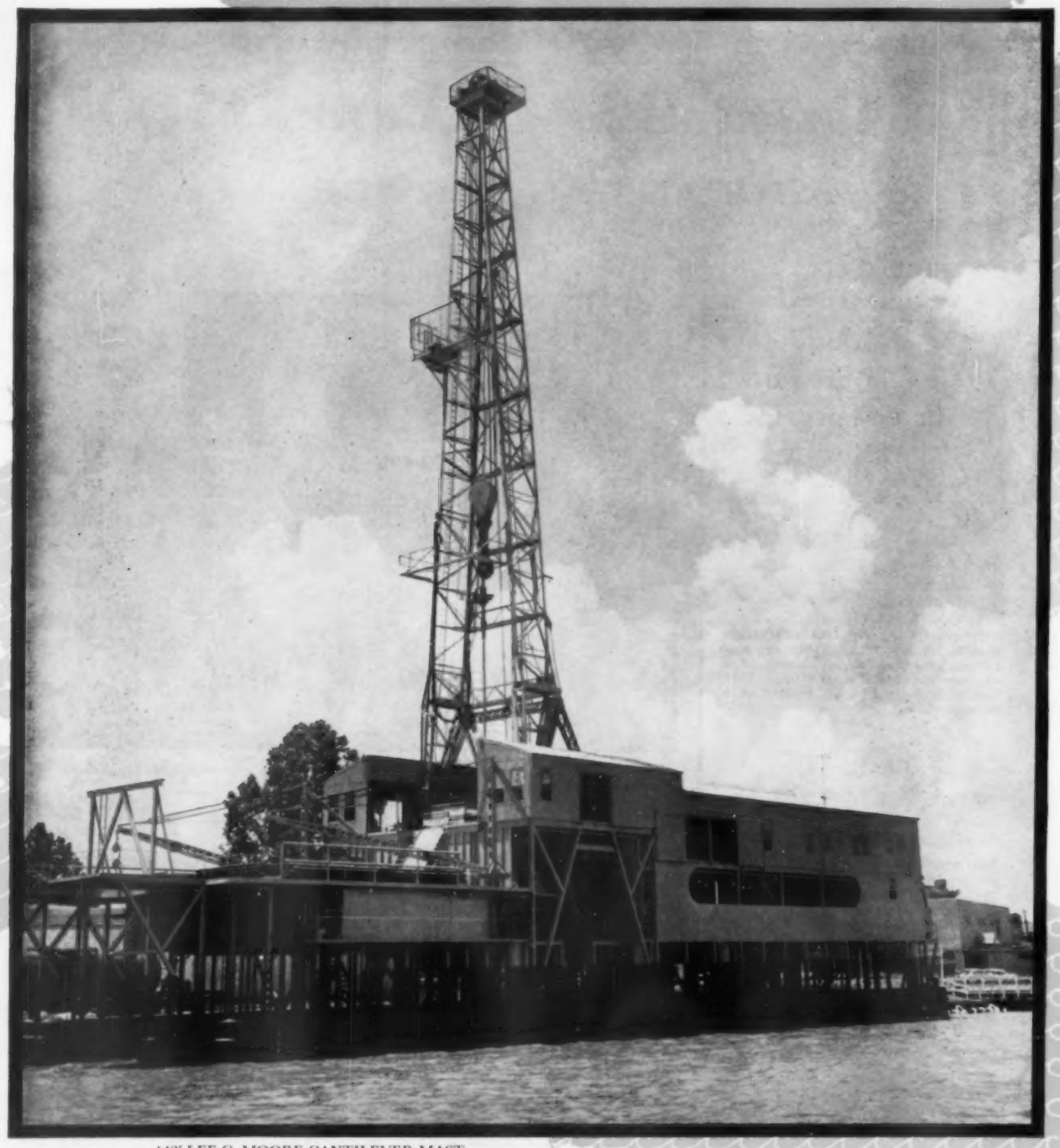

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Whether offshore or inshore . . . whatever your drilling structure needs . . . you can depend upon Lee C. Moore for valuable assistance. The many years of experience that Lee C. Moore engineers have gained by constantly working with the oil industry throughout the free world is always available to you.

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BROTHER— CAN YOU SPARE A LINE?

Can you afford to speculate with corrosion control?

Of course, you can't spare a line—even an inch of line! Conditions today are tighter than ever. **This means you can't afford to gamble with corrosion control.** Protective Coating Materials of the Plastics and Coal Chemicals Division give you time-tested pipeline protection. Superlative continuity, impermeability, bond, body strength, stability, and chemical inertness—from highest quality coal-tar pitch.

Proved and improved for three generations, our Pipeline Primers, Enamels, and auxiliary Protective Pipeline Felts, form a lasting barrier against corrosive elements. A staff of Field Service experts are at your call to offer you technical assistance that can save you maintenance time and costs.

Always ask your mill or field applicator to use our time-proved Protective Coating Materials. Write for full information.

PLASTICS AND COAL CHEMICALS DIVISION

Formerly part of the Barrett Division

40 Rector Street, New York 6, New York

Allied Chemical

STOP STALLING Next Winter

ICE-CONDITION YOUR GASOLINE FOR WINTER DRIVING NOW

Use UNICOR®-LHS—give customers sure-fire prevention of carburetor icing. Why take chances with your reputation next winter? Make sure your gasoline is safeguarded against carburetor icing. Give it sure protection with UOP's amazingly effective new anti-icing agent—UNICOR-LHS!

UNICOR-LHS added to your gasoline keeps cars rolling, customers happy. Convenient and economical to use, this fast-acting new anti-icing additive can be introduced anywhere—refinery, bulk plant or filling station—at less than half the cost of ordinary anti-icers. Furthermore, UNICOR-LHS retains its effectiveness indefinitely after adding to gasoline.

One of a widely-used line of UOP inhibitors and additives for improving liquid fuels and protecting equipment, you can depend on UNICOR-LHS to do the job—to prevent carburetor icing, stop stalling.

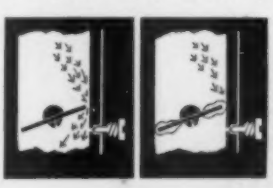
For samples or commercial quantities, and how-to-use-it information, write:

UNIVERSAL OIL PRODUCTS COMPANY
30 Algonquin Road, Des Plaines, Illinois, U.S.A.

UNICOR-LHS OFFERS THESE 6 BIG ADVANTAGES

1) MOST POTENT anti-icing agent, not just a de-icer. Prevents stalling due to ice formation—40 times more effective than alcohol types. **2) NO DILUTION** of gasoline. Used in low concentration, causes no significant loss in BTU value of gasolines. **3) CONVENIENT, ECONOMICAL.** Less than half the cost of ordinary anti-icers. Applied anywhere—refinery, bulk plant or filling station. **4) INSTANTLY MISCIBLE** in even lightest components of high vapor pressure winter-grade gasolines, is not water soluble. **5) PREVENTS RUST** and corrosion all along the line—from refinery processing equipment through distribution and storage facilities. **6) PROVIDES FULL PERMANENT PROTECTION** until fuel is burned.

IMMEDIATELY AVAILABLE—samples, commercial quantities and information on most economical way to use.



This diagram shows how thin coating of ice on carburetor valve shuts off gasoline mixture, causes idling engine to stall. UNICOR-LHS prevents such ice formation and stalling.

NOW...HIGH SPEED VALVE OPERATION...
slow speed seating Advantages

The illustration shows a style HM LimiTorque with "Hi-Lo" attachment mounted on a W-K-M 16" series conduit valve for operation on a large oil pipeline. The particular Unit causes the valve to open the full 16" of travel in 12.5 seconds, and close the valve through the same distance in 2 minutes and 40 seconds.

WITH THE NEW
Hi-Lo
LimiTorque
ATTACHMENT

LimiTorque now has available a complete new design "Hi-Lo" 2-speed attachment, which is a magnetic clutch actuated gear reduction unit. The "Hi-Lo" attachment is mounted between the motor and the LimiTorque housing, and permits operation at either of 2 "speeds", and is capable of changing speeds under load. It permits hi-speed valve operation and still retains the slow speed seating characteristics required by most valves.

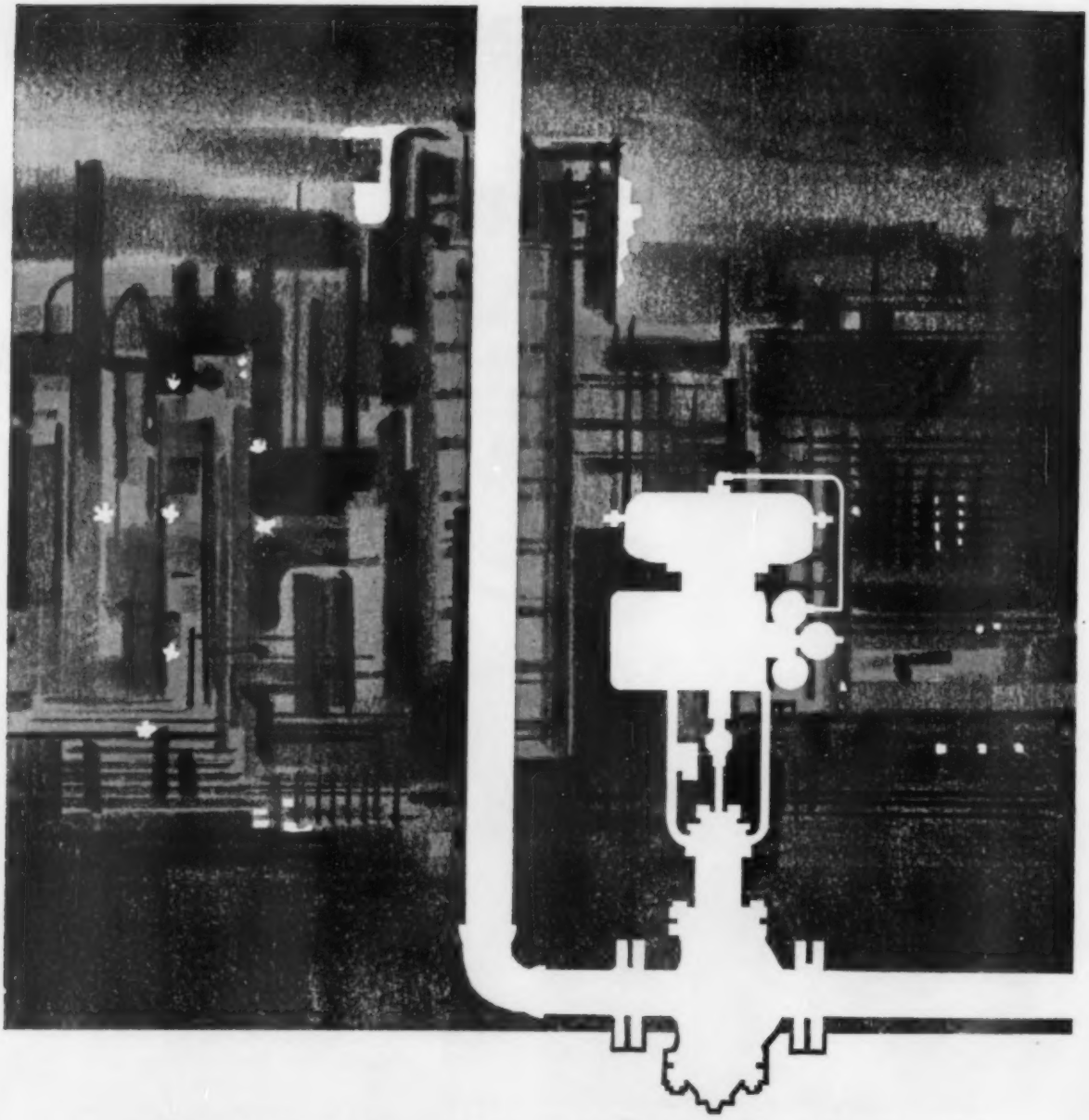
The "Hi-Lo" attachment permits as high as 18:1 ratio in speeds, and is controlled either by pre-set limit switches or relays mounted in the LimiTorque Operator or by other control devices located on associated equipment furnished by us or others.

The "Hi-Lo" attachment to the LimiTorque Valve Unit makes it ideal for the special requirements of water works, oil refineries, and sewage treatment plants, etc., where normal operating conditions require low or medium speed operation, but under emergency conditions fast speed operation is a must. Line surge or hammer is reduced under emergency hi-speed operation by changing to low speed operation prior to seating. Further information available from Philadelphia Gear Corporation.

LimiTorque®

There is no Substitute for Limitorque

PHILADELPHIA GEAR CORPORATION
ERIE AVE. & G STREET, PHILADELPHIA 34, PENNA.
Offices in all Principal Cities
INDUSTRIAL GEARS & SPEED REDUCERS • FLUID MIXERS
Limitorque Corporation • Philadelphia



...almost forgotten...because it does its job so well!

Dependable, year-after-year performance makes a Fisher Diaphragm Motor Valve the preferred control in the power and process industries. The Fisher D.M.V. has features not available on other brands. The extra thick steel casing, the precision finished valve stem, the large capacity and the trouble-free operation —these are just a few of the reasons a Fisher gets the nod when it comes to diaphragm motor valve selection.

If you want to know more about the ultimate in control—the Fisher Diaphragm Motor Valve —write for Bulletin E657A.

IF IT FLOWS THROUGH PIPE ANYWHERE IN THE WORLD... CHANCES ARE IT'S CONTROLLED BY

FISHER GOVERNOR COMPANY

Marshalltown, Iowa / Woodstock, Ontario / London, England

FISHER® Controls

SINCE 1880

YOU SPECIFY PETRECO... YOU BUY CONTINUOUS SERVICE WHEN YOU SPECIFY PETRECO... YOU BUY CONTINUOUS SERVICE WHEN YOU

Petreco electric petroleum treating equipment offers you continuity in *two* senses.

First, in your day-to-day operation, a Petreco installation means the *uninterrupted flow* of a precisely treated product (whether it be a producing or a refining operation).

Secondly, and in the broader sense, it means perfect assurance of *service "follow-through"*—the kind of future organizational support you have a right to expect from a leader in its field.

The results are: (1) the *proper design* for your operation and, (2) a *constant concern* for your treating problems—not just for today, but for the years ahead.

Throughout the petroleum world, Petreco processes *and services* are eliminating many of the problems and uncertainties that used to be consigned to intuitive "guess"timations—operations that Petreco equipment is now controlling with *automatic* regularity and precision.

FOR FURTHER INFORMATION ON THE CONTINUOUS • AUTOMATIC • COMPACT • ECONOMICAL OPERATION of the FOLLOWING PROCESSES...

ELECTROFINING • SWEETENING • DESALTING • LUBE OIL TREATING
DESAPONIFICATION • SEDIMENT SEPARATION • DEHYDRATION

...write or call

PETRECO

A DIVISION OF PETROLITE CORPORATION

AP 58-1

3202 SO. WAYSIDE DRIVE, HOUSTON 1, TEXAS
1390 E. BURNETT STREET, LONG BEACH 7, CALIF.

Specialized Petroleum Treating Processes and Equipment—DESALTING • DEHYDRATING • DISTILLATE TREATING • SWEETENING • LUBE OIL TREATING SEDIMENT REMOVAL

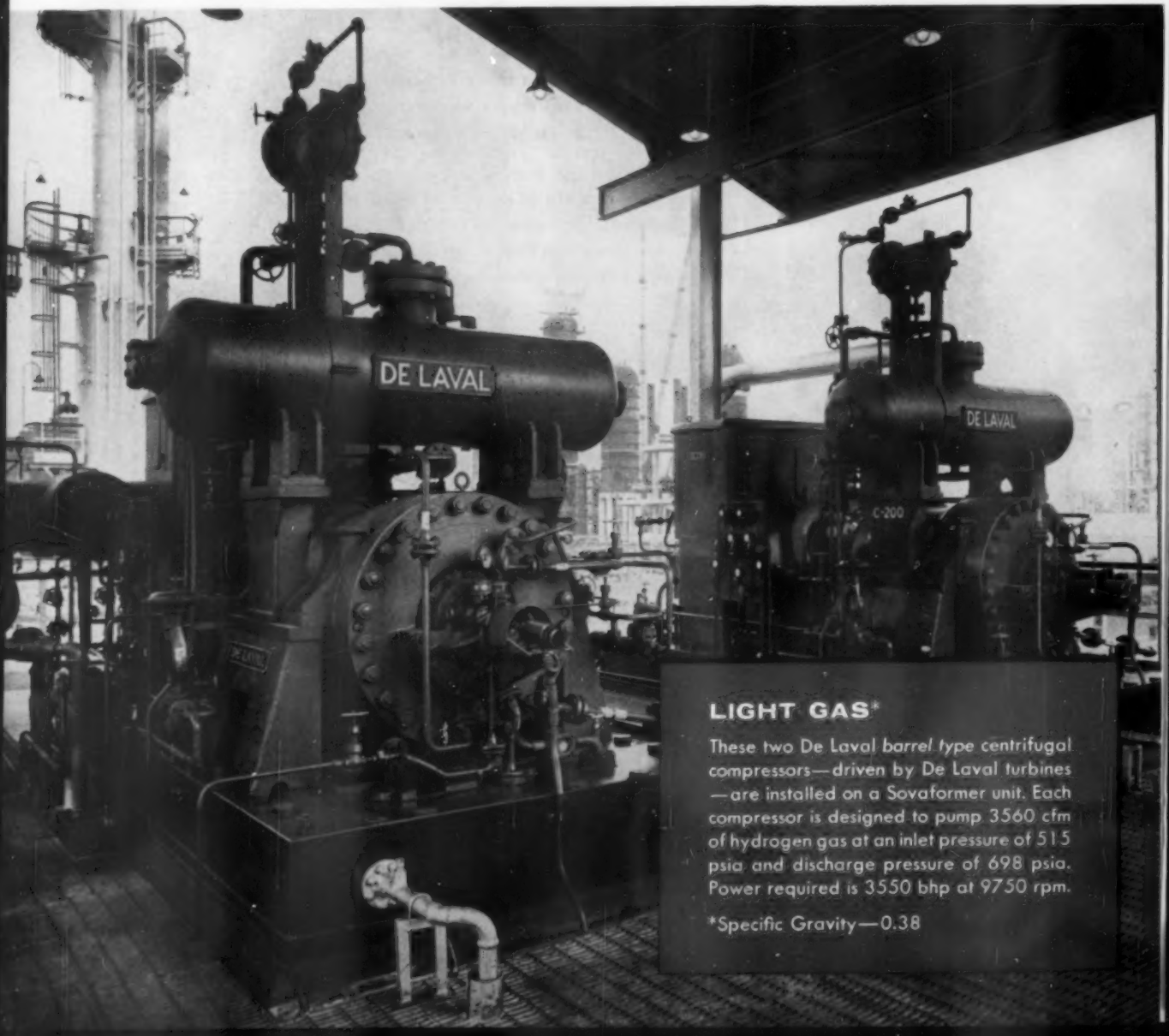
DE LAVAL CENTRIFUGAL COMPRESSORS used for light gas, in Magnolia

As part of the expansion program in the Beaumont, Texas refinery of the Magnolia Petroleum Company, De Laval turbine-driven centrifugal compressors are on stream in three important applications:

- **recirculating hydrogen gas in a reforming unit**
- **pumping hydrocarbon gas in a compressor station**
- **supplying combustion air on a giant cat cracker**

Designed and built to perform dependably in heavy-duty continuous operation, De Laval centrifugal compressors are available for every refinery process. Whether you need to handle light or heavy gases at high or low pressures in catalytic cracking, reforming, alkylation, coking or any similar service, it pays to look to De Laval. We can give you the benefit of more than 40 years of experience in solving gas compression problems.

SEND FOR DE LAVAL BULLETIN 0504.

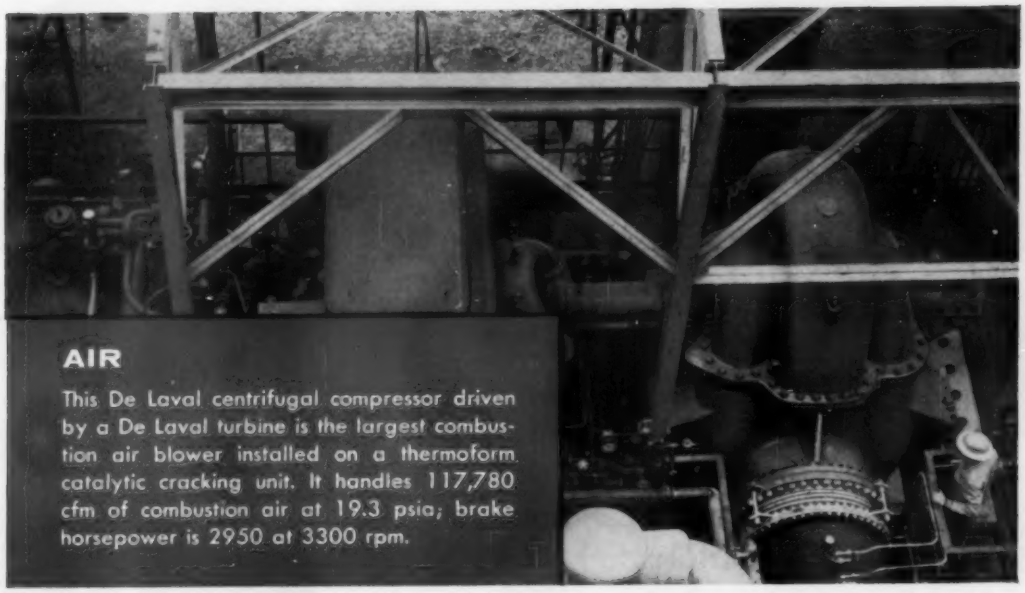


LIGHT GAS*

These two De Laval *barrel type* centrifugal compressors—driven by De Laval turbines—are installed on a Sovaformer unit. Each compressor is designed to pump 3560 cfm of hydrogen gas at an inlet pressure of 515 psia and discharge pressure of 698 psia. Power required is 3550 bhp at 9750 rpm.

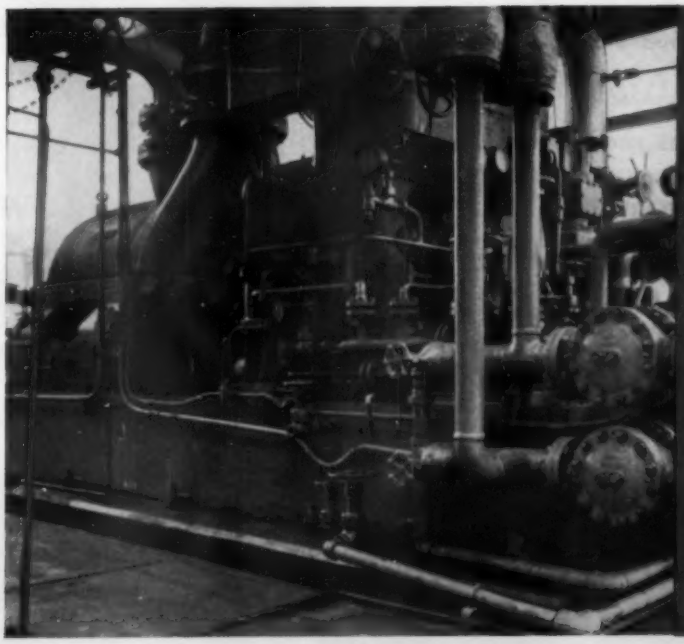
*Specific Gravity—0.38

heavy gas and air handling
Petroleum's expansion program



AIR

This De Laval centrifugal compressor driven by a De Laval turbine is the largest combustion air blower installed on a thermoform catalytic cracking unit. It handles 117,780 cfm of combustion air at 19.3 psia; brake horsepower is 2950 at 3300 rpm.



HEAVY GAS*

This De Laval centrifugal compressor and turbine installation is located in Magnolia Petroleum's number 1 gas compressor station. The unit is designed to pump 10,560 cfm of hydrocarbon gas at 65.0 psia with a suction pressure of 14.0 psia.

* Specific Gravity—1.376

DE LAVAL *Centrifugal Compressors*

DE LAVAL STEAM TURBINE COMPANY
810 Nottingham Way, Trenton 2, New Jersey

DL-419

HAMMOND IRON WORKS

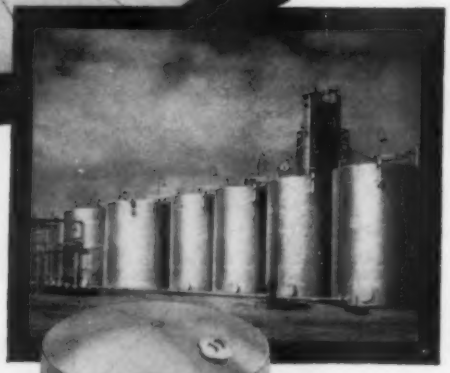
announces

THE HAMONDFLOTE* plastic COVER

HAMONDFLOTE COVER

the first practical and guaranteed

FLOATING ROOF

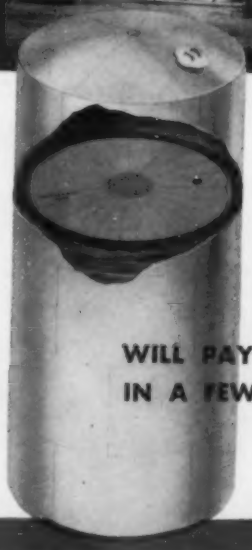


FOR small diameter tanks in MARKETING, BULK STORAGE, PRODUCING and REFINING OPERATIONS.

Suitable for storing gasolines, crude oils, and hydrocarbon chemicals.

The HAMONDFLOTE COVER is constructed of rigid polyisocynate foam—a plastic material with exceptionally low density and high load carrying capacity.

- **CONSERVES VAPOR • PRESERVES PRODUCT**
- **PREVENTS CORROSION • LOW COST—NO MAINTENANCE**
- **UNSINKABLE • VIRTUALLY INDESTRUCTIBLE**
- **LONG LIFE**—(more than 10 years expectancy)
- **UNAFFECTED BY WORKING TEMPERATURES** —(from —94° to +300° F)
- **EASILY INSTALLED OR REMOVED**



WILL PAY FOR ITSELF IN A FEW MONTHS.

Write or call us and we will send our nearest representative to give you full information.

*Pat. Pending, Trade Mark reg.

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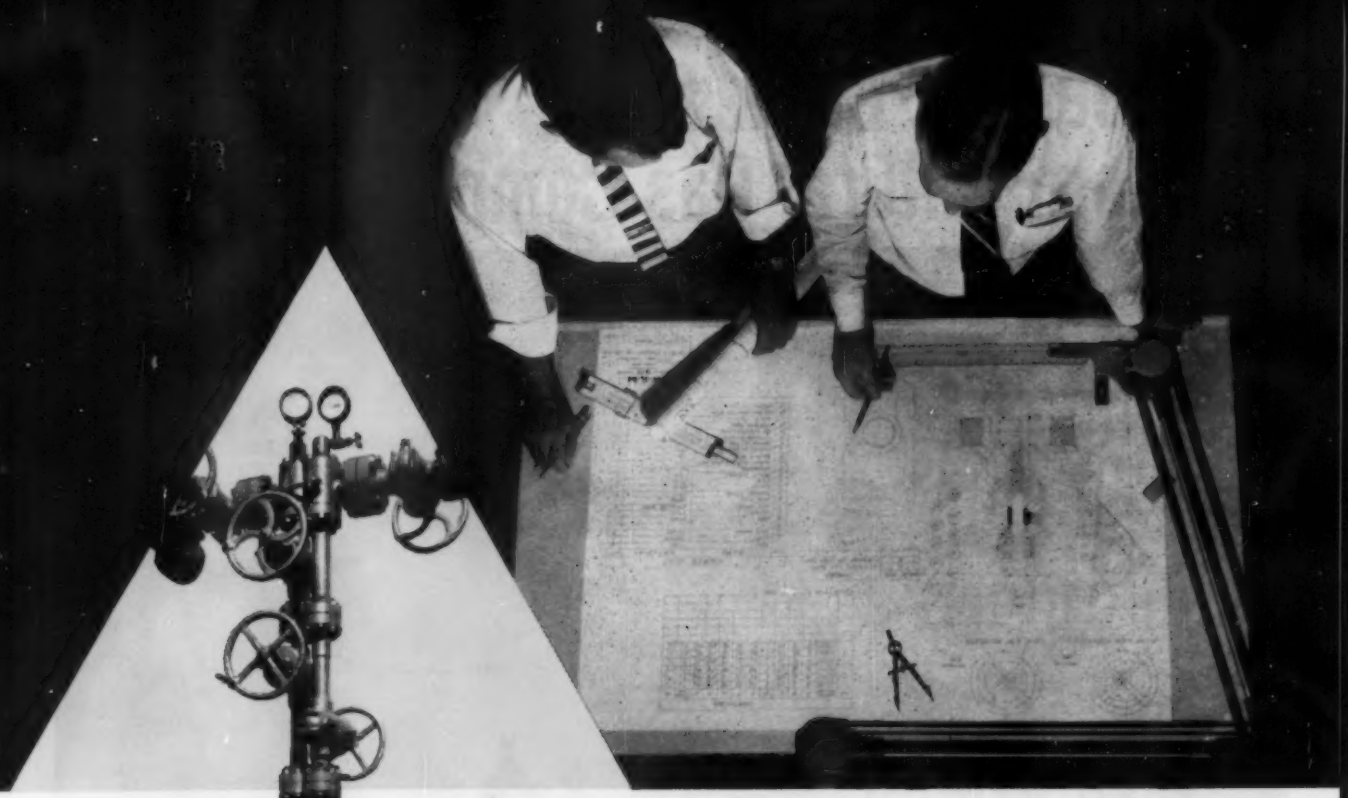
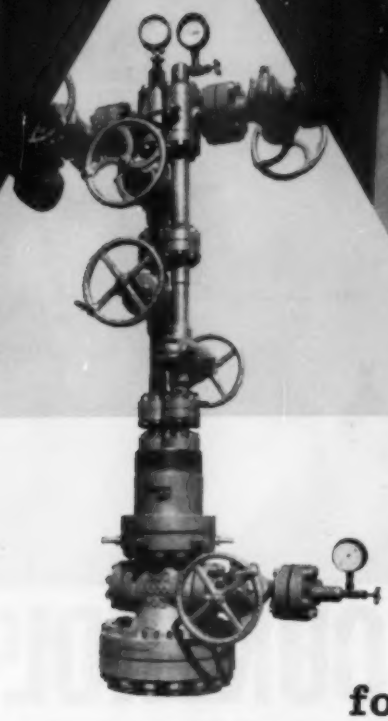




W-K-M *Creative Engineering* sets the industry standard for Through-Conduit Gate Valves

W-K-M
Recessed Body Valves
for Dual Completion Christmas Trees

These recessed body valves illustrate how W-K-M's creative engineering solves your problems. The recessed body was achieved without impairing the efficiency of the typical W-K-M design. These valves give you the benefits of W-K-M's parallel expanding gates, controlled force seating, free flow through the valve without turbulence or pressure drop, and can be completely overhauled in the line.

Sizes: 1½", 1¾", 2", 2½" and 3". Working pressures, 2000 pounds to 5000 pounds.

WRITE FOR CATALOG 200

The creative engineering behind W-K-M Through-Conduit Gate Valves sets industry standards for design . . . dependability . . . easy operation . . . long life and low maintenance costs. Quality of workmanship and material is rarely duplicated, never surpassed. In the field, service is prompt, skilled and helpful.

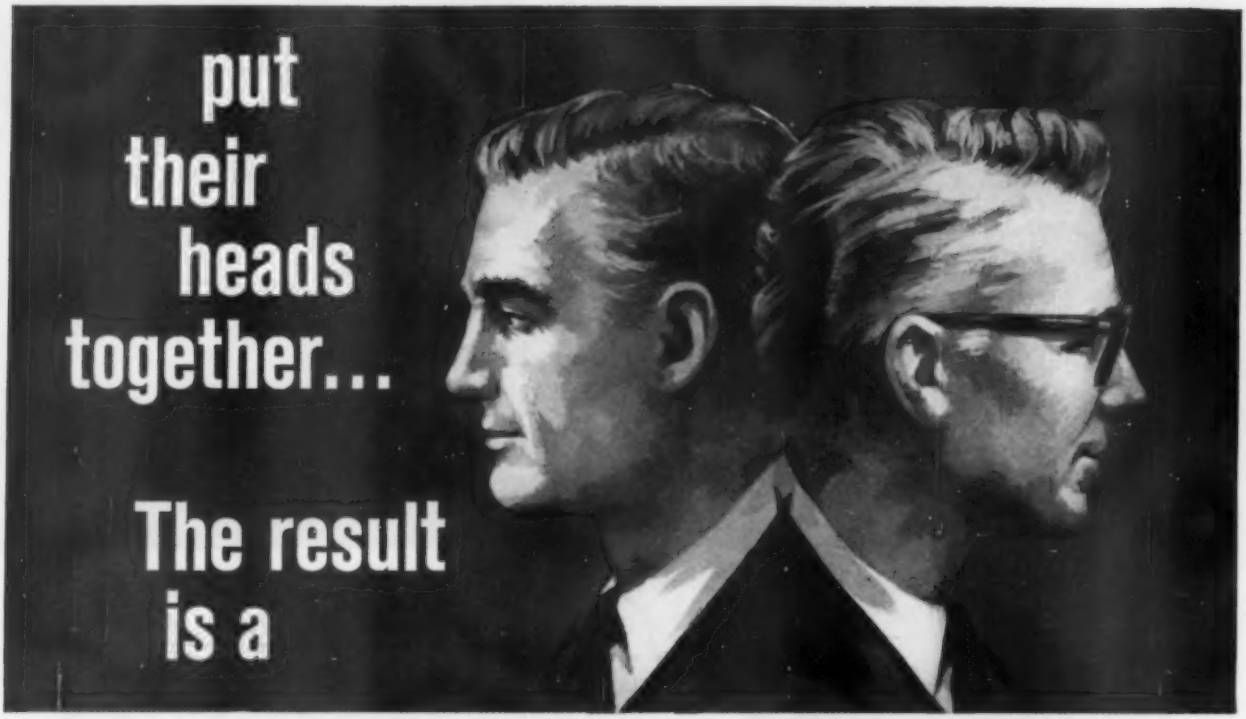
ON HAND. The most used sizes of W-K-M Gate Valves are carried by supply stores everywhere. Special sizes and special designs are produced as you need them.

W-K-M

DIVISION OF ACF INDUSTRIES INCORPORATED
P. O. BOX 2117, HOUSTON, TEXAS

5909

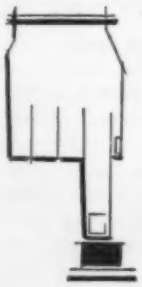
Engineers at Clark and Northern Natural Gas Company

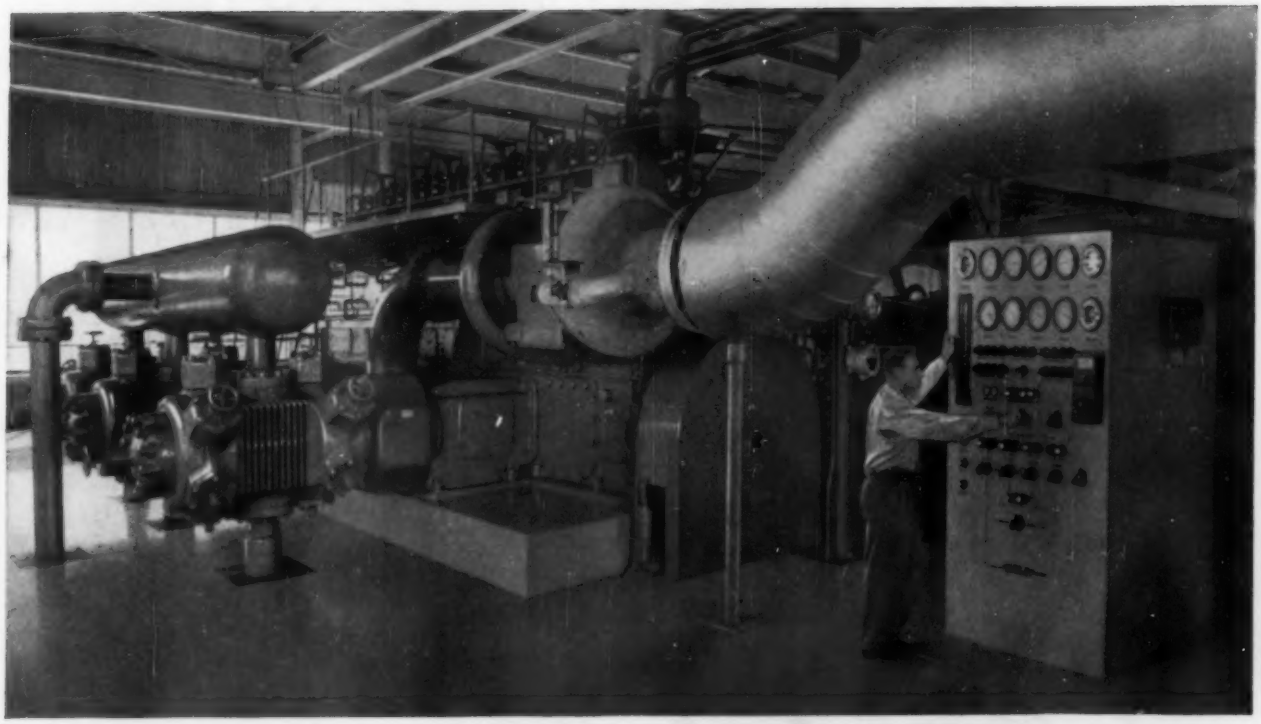


FULLY AUTOMATIC CONTROL

FROM STOP
TO FULL LOAD IN MINUTES!

The Clark-designed Fully Automatic Control Panel starts the engine automatically, allows a warmup period, sequences the valves for purging and blow down, and puts the compressor on line —with a single push of the start button. In case of temperature and pressure malfunction, it will give an alarm signal ... and upon continued malfunction, it will shut down the engine and sequence the valves to their off-line position. A single push of a stop button will accordingly remove the unit from service whenever required.





PANEL FOR OPERATING PIPELINE COMPRESSORS!

Problem: Northern Natural Gas Company wanted to centralize and simplify all of the starting and successive functions involved in putting their new Clark TLA-6 Compressor engines on line—in a matter of minutes, with all due safeguards against malfunction.

Solution: Engineers at Clark and Northern Natural Gas Company put their heads together—and off their planning boards came the fully Automatic Control Panel now in successful operation. A simple push of the button sets off an automatic multi-phased starting and warmup operation, with precision timed and preset selections... puts the pipeline compressors on line within minutes ... controls the smooth, uninterrupted compressor service throughout.

This is another example of Clark's expert collaboration with the gas industry in devising ever-better solutions to pipeline problems . . . another instance of the value to be derived from the Clark *encyclopedia of experience.* For more facts on how Clark can help you solve compressor problems call your nearby Clark representative. Write today for Bulletin No. 151, to 1104 Lincoln Avenue, Olean, New York.

CLARK BROS. CO.

One of the Dresser Industries

Sales and service outlets in principal cities throughout the world

CLARK ONE OF THE DRESSER INDUSTRIES

TURBOCHARGED COMPRESSORS

MILLIONS OF STOPPERS

against fluid loss . . . thousands of feet below!

There's a real guard against fluid loss when fracturing fluids are treated with Adomite. Its millions of tiny particles temporarily seal the pores of the matrix rock. This means that fluids can be injected under greater pressures, at higher injection rates . . . and it means more profits, too! Adomite makes it possible to get an extended, deeper fracture . . . with minimum sanding out.

Adomite leaves no permanent seal on the fracture wall. There is no evidence that the formation has ever been sealed. And here are other important reasons why more producers *standardize* on Adomite:

- Obtains larger fractures per volume of treatment, or the same-sized fracture with a lesser volume of fracturing oil.
- Decreases friction loss because of the low viscosity of Adomite-treated fluids.
- Utilizes your own lease crudes . . . saves transportation costs.
- Assures acceptance by the pipeline companies for Adomite-treated lease crudes.

For greater profits . . . fracture with

ADOMITE®

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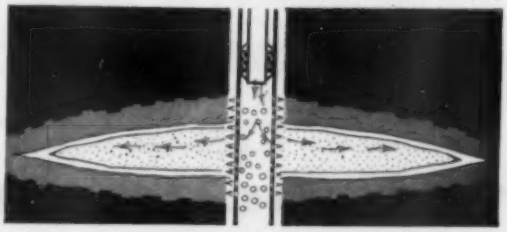

Are you losing business with "busy" signals?

A switchboard jammed by *inside* calls can cost you *plenty* in the fast-moving oil business.

You just can't afford to let a busy superintendent, a lease agent or an important customer wait until your phone lines are open.

What you need is a P-A-X business telephone system. P-A-X is your own private dial telephone system for calls *within* your organization. It is fully automatic — entirely independent of your switchboard. Leaves your present board free to handle outside calls swiftly and efficiently.

Moneysaving advantages

P-A-X saves time. Employees dial their calls instead of walking to other offices. Executives get action. Customers phoning in get you the *first* time they call!

There are no rental charges for P-A-X. You *own* the system. And it soon pays for itself.

We'll be glad to send you an interesting case history brochure that tells how P-A-X is saving important money for a major oil company. Mail the coupon today!

Manager, P-A-X Sales
Automatic Electric Sales Corp.
Northlake, Illinois

☐ *Send me information on Petroleum P-A-X*
☐ *Have your representative call*

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Title .....
Company .....
Type of Business .....
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AUTOMATIC ELECTRIC

Announcing

a great advancement in

DRILLING CONTROL *for* MEDIUM SIZED RIGS

The MARTIN-DECKER

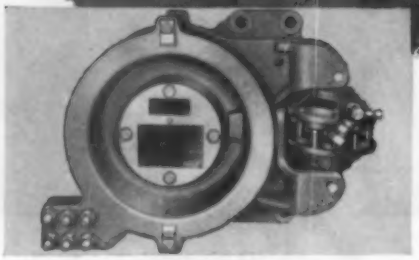
LOW COST

TYPE "FS" WEIGHT INDICATOR

NOW equipped with the Famous

*SENSATER

for greater accuracy and sensitivity



MARTIN-DECKER *is now offering the Type "FS" Weight Indicator with the famous Sensater replacing the piston as the sensing element. This gives the "FS" all the advantages of its bigger brothers—the "E" and "D" Weight Indicators.*

THE SENSATER realizes every weight change no matter how small and relays it instantly to the Indicator mounted conveniently in front of the driller. At medium depths small weight changes are very important and must be known for best operation. It is in the medium range that competition is extremely strong and footage rates cut to the barest margin of profit. A rig operator cannot afford any unnecessary loss of time and must make the best use of all drilling time. The Type "FS" is the best insurance against lost time due to fishing jobs, giving him quick and better recovery. The sensitivity and accuracy in this instrument will give the best use of all drill collars run . . . and faster, better hole.

The anchor installation provides a quick, easy method of slipping the line and because the Sensater is an integral part of the anchor there is no need to move the pressure transformer during the operation — thus preventing one of the major causes of Weight Indicator damage.

The indicator has a net weight on bit pointer and dial that is extremely helpful to the driller in maintaining a constant bit weight. Experience has shown this instrument to be accurate and dependable for many years of trouble-free operation.

THE ANCHOR—The Type "FS" Wire Line Anchor is manufactured by the National Supply Company. It is similar to the "E" and "D" anchors with the exception of being lighter, smaller and designed for side mounting. It provides a simple, convenient method of slipping the line and does not require the removal of the Sensater.

THE SENSATER — The Sensater sensing element in the "FS" is a smaller edition of the one incorporated in the "E" and "D" instruments and offers all the advantages of the larger cell. This new addition to the "FS" instrument makes it even more attractive to the operator who desires a sensitive, accurate weight indication at low cost.

THE GAUGE — The Type "FS" gauge is equipped with a total load pointer and a four-to-one vernier pointer for extra sensitivity. There are also two dials: the inner dial, reading in pounds or kilos, for the total load and the outer dial is adjustable to enable the operator to read the weight on the bit or the net pull on the pipe when fishing or in a tight hole.

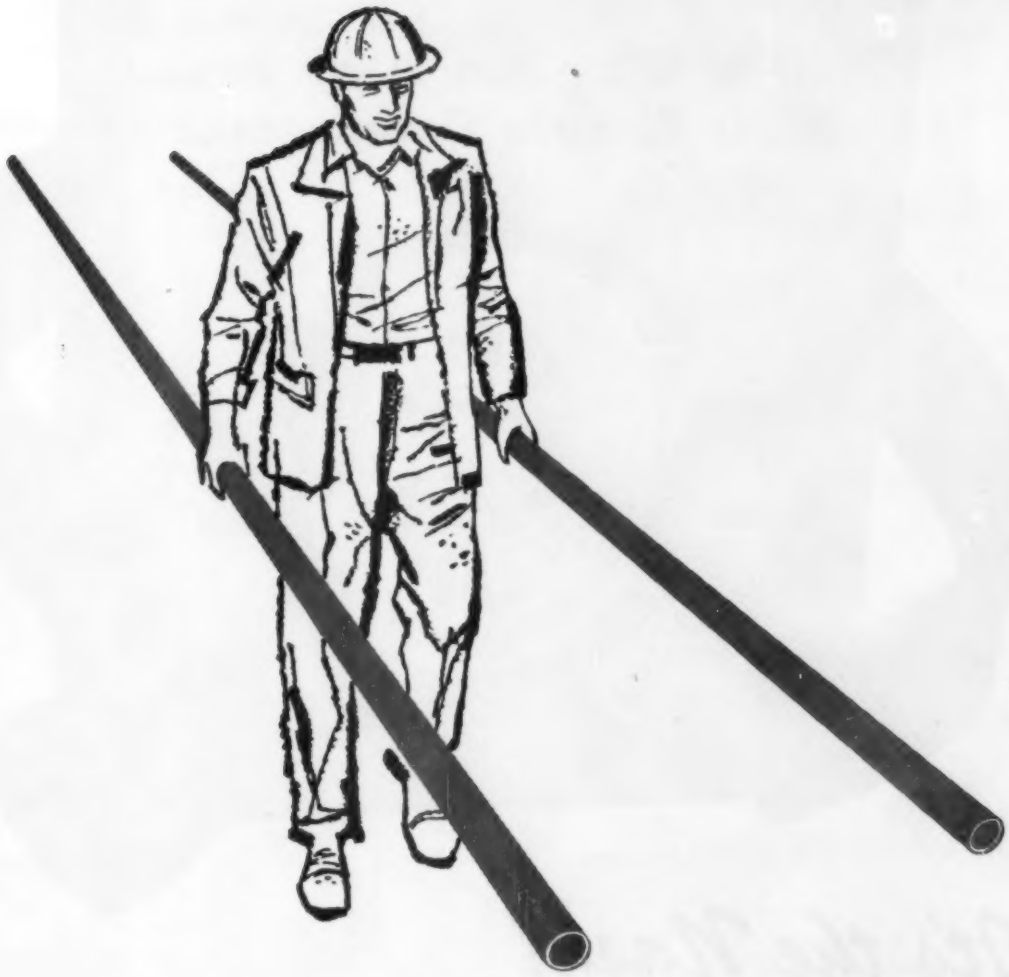
***SENSATER—Extra Accurate—Extra Sensitive—Extra Dependable**

Write For Descriptive Literature

MARTIN-DECKER CORP.

HOME OF THE WEIGHT INDICATOR — LONG BEACH, CALIFORNIA

Martin-Decker Weight Indicators and National Wire Line Anchors are sold through the Reed Roller Bit Company, the National Supply Company, and other recognized supply houses, as well as by the Martin-Decker Corporation, 3431 Cherry Avenue, Long Beach 7, Calif.



Low installed cost and no maintenance . . . Portable Piping of ALCOA ALUMINUM

Talk about economy! Alcoa's lightweight aluminum pipe means major savings on your piping for water supply, gas lines, gathering systems, tank battery lines and vent lines.

Light weight cuts hauling, handling, installing costs: Because it's so light, you can haul larger quantities of Alcoa® Aluminum Pipe in every truckload. One man can easily handle standard lengths, and that means small crews can lay long lines quickly and easily. The net result is a big cut in installation costs.

Excellent corrosion resistance eliminates heavy maintenance and replacement costs: Severe operating conditions pose no problem for corrosion-resistant aluminum pipe. And it takes the abuse of being laid or strung from supports over rough terrain.

Cut *your* piping costs with portable piping of safe, non-sparking Alcoa Aluminum. It's available—along with quick couplings of aluminum—through a nationwide network of distributors. You'll find them listed under "Pipe" in the Yellow Pages of your telephone directory. Check your nearest distributor for a complete list of sizes available . . . or mail the convenient coupon.

"ALCOA THEATRE"
Exciting Adventure
ALTERNATE MONDAY EVENINGS

ALCOA ALUMINUM
ALUMINUM COMPANY OF AMERICA

Aluminum Company of America
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☐ Please send me your new literature describing portable oil country piping of Alcoa Aluminum.

☐ I need low cost, portable piping for the following services:

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

It's the Nash!

There are no mechanical complications in a Nash Compressor. A single moving element, a round rotor, with shrouded blades, forming a series of buckets, revolves freely in an elliptical casing containing any low viscosity liquid. This liquid, carried with the rotor, follows the elliptical contour of the casing.

The moving liquid therefore recedes from the rotor buckets at the wide part of the ellipse, permitting the buckets to fill with gas from the stationary Inlet Ports. As the casing narrows, the liquid is forced back into the rotor buckets, compressing the gas, and delivering it through the fixed Outlet Ports.

Nash Compressors produce 75 lbs pressure in a single stage, with capacities to 6 million cu. ft. per day in a single structure. Since compression is secured by an entirely different principle, gas pumping problems difficult with ordinary pumps are often handled easily in a Nash.

Nash simplicity means low maintenance cost, with original pump performance constant over long periods Data on these pumps sent immediately on request

No internal wearing parts.

No valves, pistons, or vanes.

No internal lubrication.

Low maintenance cost.

Saves floor space.

Desired delivery temperature automatically maintained.

Slugs of liquid entering pump will do no harm.

75 pounds in a single stage.

NASH ENGINEERING COMPANY
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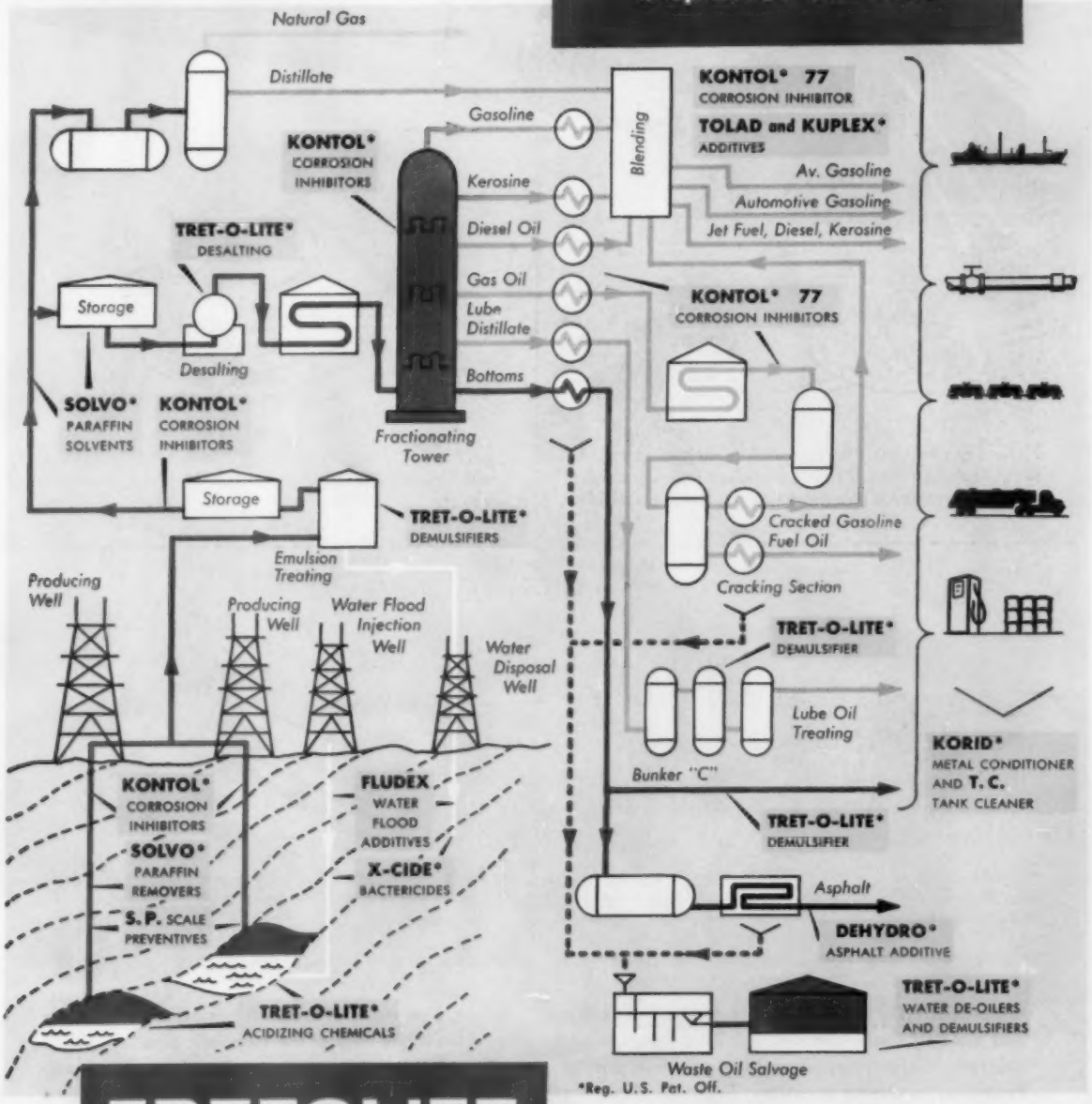
TRETOLITE

provides proved products, superior service



*Reg. U.S. Pat. Off.

TRETOLITE COMPANY

DIVISIONS OF PETROLITE CORPORATION

369 Marshall Avenue, St. Louis 19, Missouri

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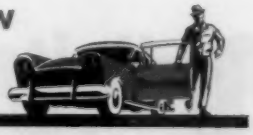
ASK THE MAN IN THE RED CAR



He'll show you how to get maximum results at minimum cost from any or all of the Tretolite Products.

Canadian Headquarters
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Naugatuck KRALASTIC

Natural gas lines can't rot or rust when made of corrosion-proof Kralastic® Pipe. It's completely free from electrolytic action—never needs coating, lining, or anode protection.

You can easily and economically lower your irrigation costs with Kralastic Pipe. Tough and hard, it is not affected by weather and is impervious to water and soil chemicals.

Kralastic is a big hit in the oil fields. It resists scaling and most chemicals—is impervious to water and soil elements. The extremely smooth internal walls minimize back pressure.

The light weight of Kralastic makes it ideal for electrical conduit—it can carry the same number of lines, with much less poundage.

Kralastic HTHT is a new resin-rubber blend extruding and molding compound that provides higher tensile strength, higher temperature resistance in piping. Because of its proved durability, toughness, flexibility, chemical resistance, light weight and speed of installation, pipe made of Kralastic has achieved a unique position in the field of thermoplastic pipe.

Write us for more information about pipe manufacturers using Kralastic HTHT—or about your own production problems.

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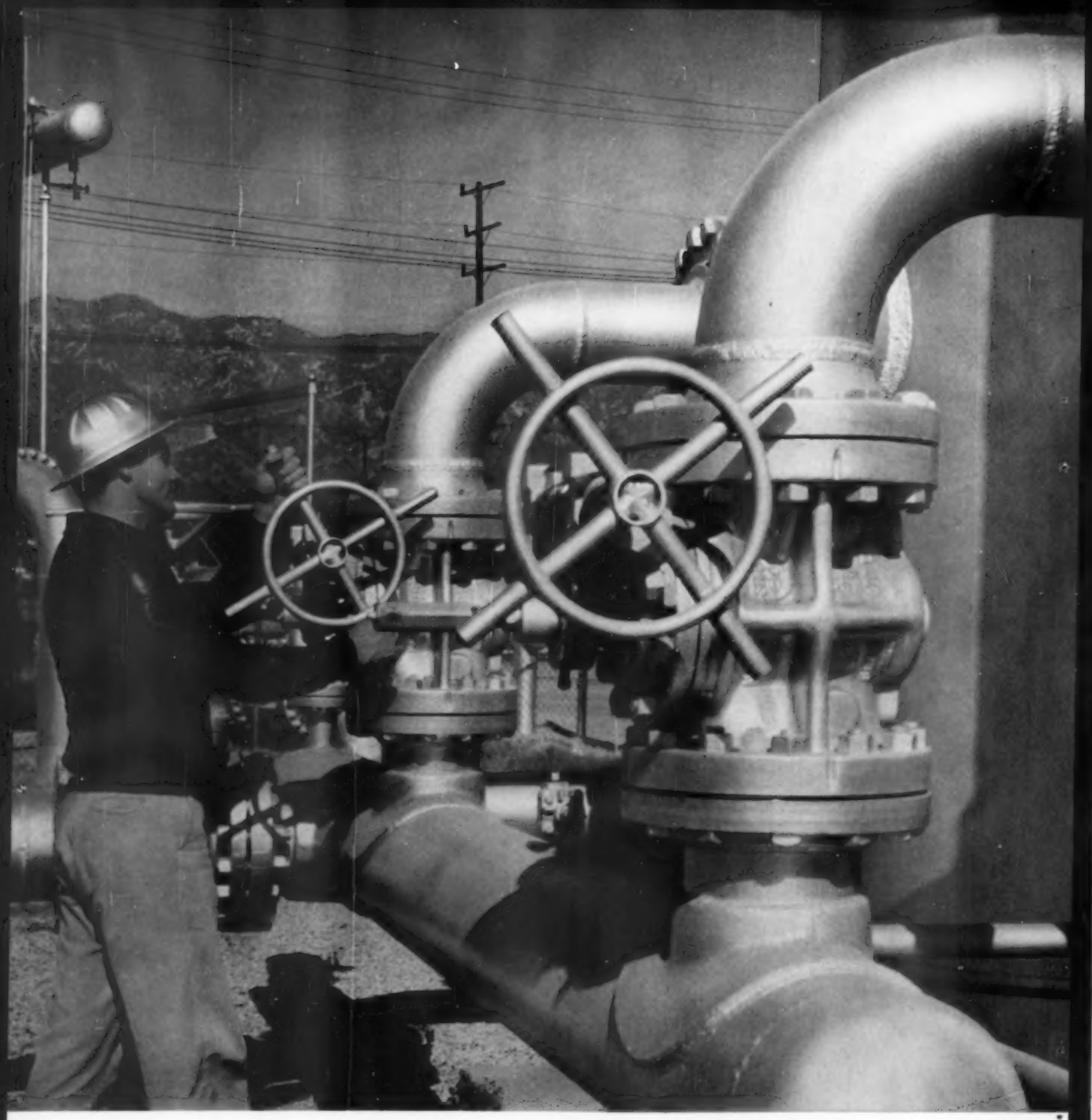
WILL IT WORK? Of course—it's a Rockwell-Nordstrom *lubricated* plug valve. Even after months in an open or closed position, the *lubricated* plug responds instantly for easy, quarter-turn operation. While there can be no compromise with absolute dependability, you pay no more, often less, for the superior reliability of Rockwell-Nordstrom valves.

Whatever your flow control needs, specify Rockwell-Nordstrom . . . the world's most *complete* line of lubricated plug valves. Rockwell Manufacturing Co., Pittsburgh 8, Pa.

ROCKWELL-Nordstrom VALVES

it's **ROCKWELL**

MANUFACTURING COMPANY



HOW TO GET THE "OFF" IN SHUT-OFF

Some valves aren't really off when they're shut because their exposed seats soon wear or cut. Rockwell-Nordstrom valves are sealed by a tough, instantly replaceable film of pressurized lubricant and the seats are never exposed to the line . . . they *stay* leakproof year after year.

Rockwell-Nordstrom is the world's most complete line of lubricated plug valves and plug valve accessories. Rockwell Manufacturing Company, Pittsburgh 8, Pa.

ROCKWELL-Nordstrom VALVES

it's ROCKWELL

MANUFACTURING COMPANY

● With the ever increasing demand for ethylene, now is the time for producers to take a long look at naphtha—a raw material that is not only practical but rapidly becoming more and more plentiful.

● Kellogg offers an unequalled background in processes and plants for the production of high-purity ethylene directly from naphtha and other liquid petroleum fractions, as well as for the recovery of ethylene.

● Utilizing its unique steam pyrolysis process, Kellogg has engineered and built nine ethylene-from-naphtha plants for leading chemical manufacturers in various parts of Europe.

● In the U.S.A. Kellogg has engineered and built a naphtha cracking plant on the Gulf Coast, and has made several economic studies in this country on naphtha and other liquid feedstocks for ethylene.

● Kellogg welcomes the opportunity to discuss with you in detail the many advantages of its steam pyrolysis process.

M KELLOGG W

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WHEELS

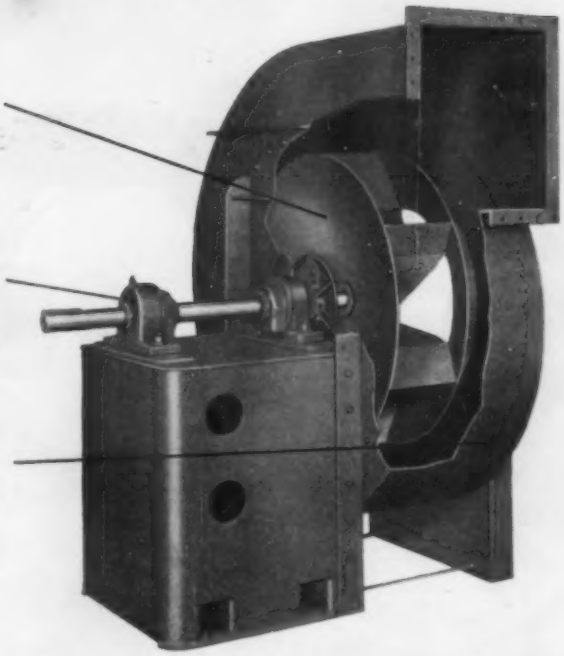
Welded steel construction. One-piece, cone-shaped rims and hubplates, standard or extra-heavy.

BEARINGS

Heavy-duty, self-aligning ball or tapered roller bearings for quiet operation, dependability, long life.

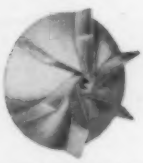
HOUSINGS

Heavy welded sheet steel or plate, adjustable discharge in sizes thru 37" inlet. Fixed discharge on larger sizes. Externally braced for maximum rigidity.



AIR HANDLING
Type AH

MATERIAL HANDLING
Type MH



LONG SHAVINGS
Type LS

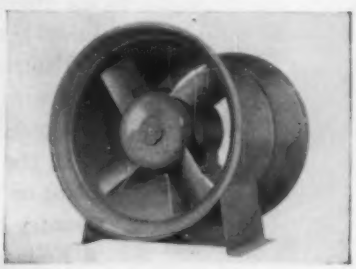
Handle any one of 3 basic processes with an American Blower Industrial Fan

Here's a practical way to solve tough process applications: an American Blower Industrial Fan. It's available with three types of wheels to let you handle air, gases, or air and gases containing material, or long shavings. And there's a wide range of fan arrangements, optional constructions — for severe duties or high-temperature operations — and optional accessories to allow fan modification for individual jobs. Equipment selection and application assistance is available, should you need it, from our 73 engineer-staffed branch offices. A phone call is all it takes to get full product information. American-Standard,* American Blower Division, Detroit 32, Mich. In Canada: Canadian Sirocco products, Windsor, Ontario.

It pays to standardize on American Blower fans for every duty!

HS Fans — direct or V-belt drive, medium-speed operation; nonoverloading.

Sirocco Fans — low speed, quiet operation; move more air per revolution.



Axial Fans — move high volumes in minimum space; flexible installation.

* American-Standard and Standard are trademarks of American Radiator & Standard Sanitary Corporation.

American-Standard Products

AMERICAN-Standard

AMERICAN BLOWER DIVISION

There is a difference in sucker rods

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SUCKER RODS

TYPE 12

For added strength to lift heavier loads with no increase in rod size.

Made from strong, corrosion resistant nickel chromium molybdenum processed electric furnace steel, fully normalized and drawn; has exceptionally high yield strength and excellent fatigue resistance.

SPECIFY—Jones Sucker Rods for deep wells and all wells . . . for proved longer life.

The S. M. Jones Company modern manufacturing plant, Toledo, Ohio

THE S. M. JONES COMPANY

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SHARE

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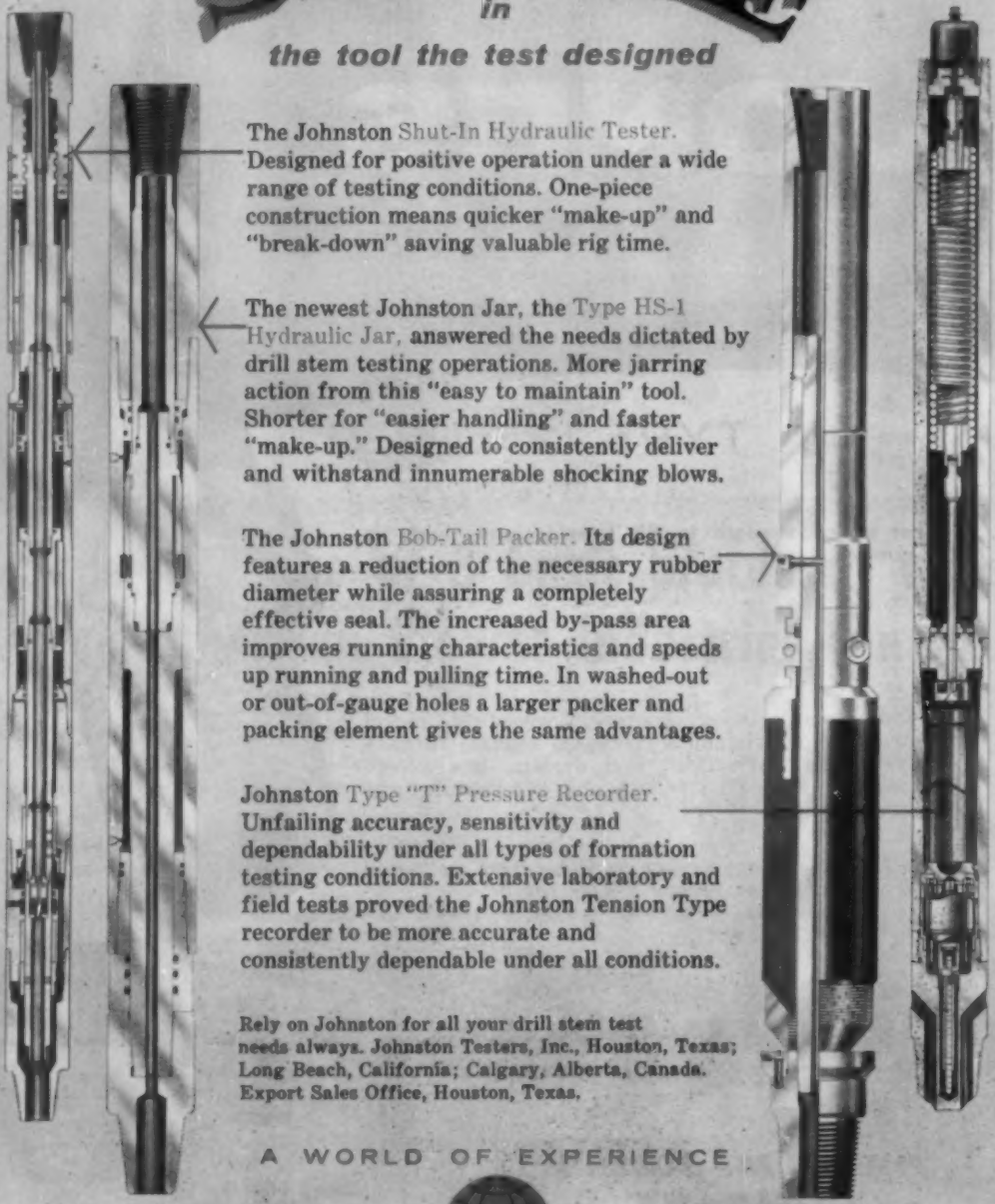
the tool the test designed



The Johnston Shut-In Hydraulic Tester. Designed for positive operation under a wide range of testing conditions. One-piece construction means quicker "make-up" and "break-down" saving valuable rig time.

The newest Johnston Jar, the Type HS-1 Hydraulic Jar, answered the needs dictated by drill stem testing operations. More jarring action from this "easy to maintain" tool. Shorter for "easier handling" and faster "make-up." Designed to consistently deliver and withstand innumerable shocking blows.

The Johnston Bob-Tail Packer. Its design features a reduction of the necessary rubber diameter while assuring a completely effective seal. The increased by-pass area improves running characteristics and speeds up running and pulling time. In washed-out or out-of-gauge holes a larger packer and packing element gives the same advantages.

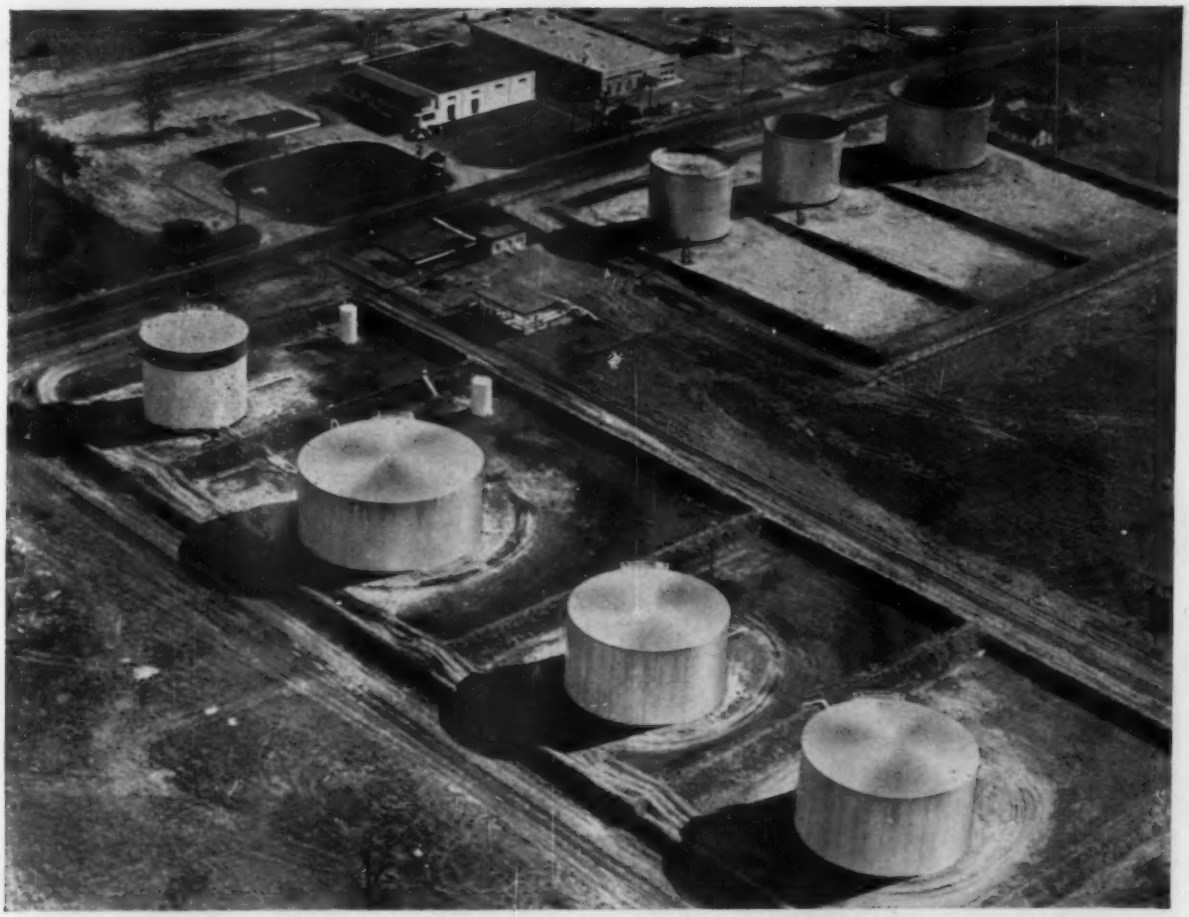
Johnston Type "T" Pressure Recorder. Unfailing accuracy, sensitivity and dependability under all types of formation testing conditions. Extensive laboratory and field tests proved the Johnston Tension Type recorder to be more accurate and consistently dependable under all conditions.

Rely on Johnston for all your drill stem test needs always. Johnston Testers, Inc., Houston, Texas; Long Beach, California; Calgary, Alberta, Canada. Export Sales Office, Houston, Texas.

A WORLD OF EXPERIENCE

JOHNSTON TESTERS

Johnston's thirty years of manufacturing and testing know-how is easily recognized in The Tool The Test Designed. Each piece of Johnston equipment is designed to meet the requirements of the test under all types of well conditions.



How Do You Plan a Terminal for the Most Efficient Operation?

Do you plan to market gasoline through many high-gallonage outlets? Or do you plan to sell a range of products, such as fuel oil, kerosene and gasoline, through more diversified outlets?

The picture shows two adjacent terminals on the same pipeline designed to operate efficiently under these two different marketing conditions.

The terminal in the background stores gasoline where pumping in and pumping out are almost daily procedures. For such operation, the owner wisely selected three Graver Double-Deck Floating Roof Tanks to combat vapor losses during frequent fillings and emptyings.

In the terminal in the foreground, storage was planned for marketing a variety of products. The Graver Expansion Roof® Tank at the left and the large cone roof tank manifolded to it preserve the volatility of stored gasoline during less frequent turnovers. The two smaller cone roof tanks hold kerosene and fuel oil.

These two adjacent terminals meet two quite different marketing requirements, yet both embody Graver's tested and proved designs for vapor-saving, profit-saving tankage. If you are planning new or enlarged terminal facilities, it pays to plan with Graver.

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POWELL

world's largest family of valves

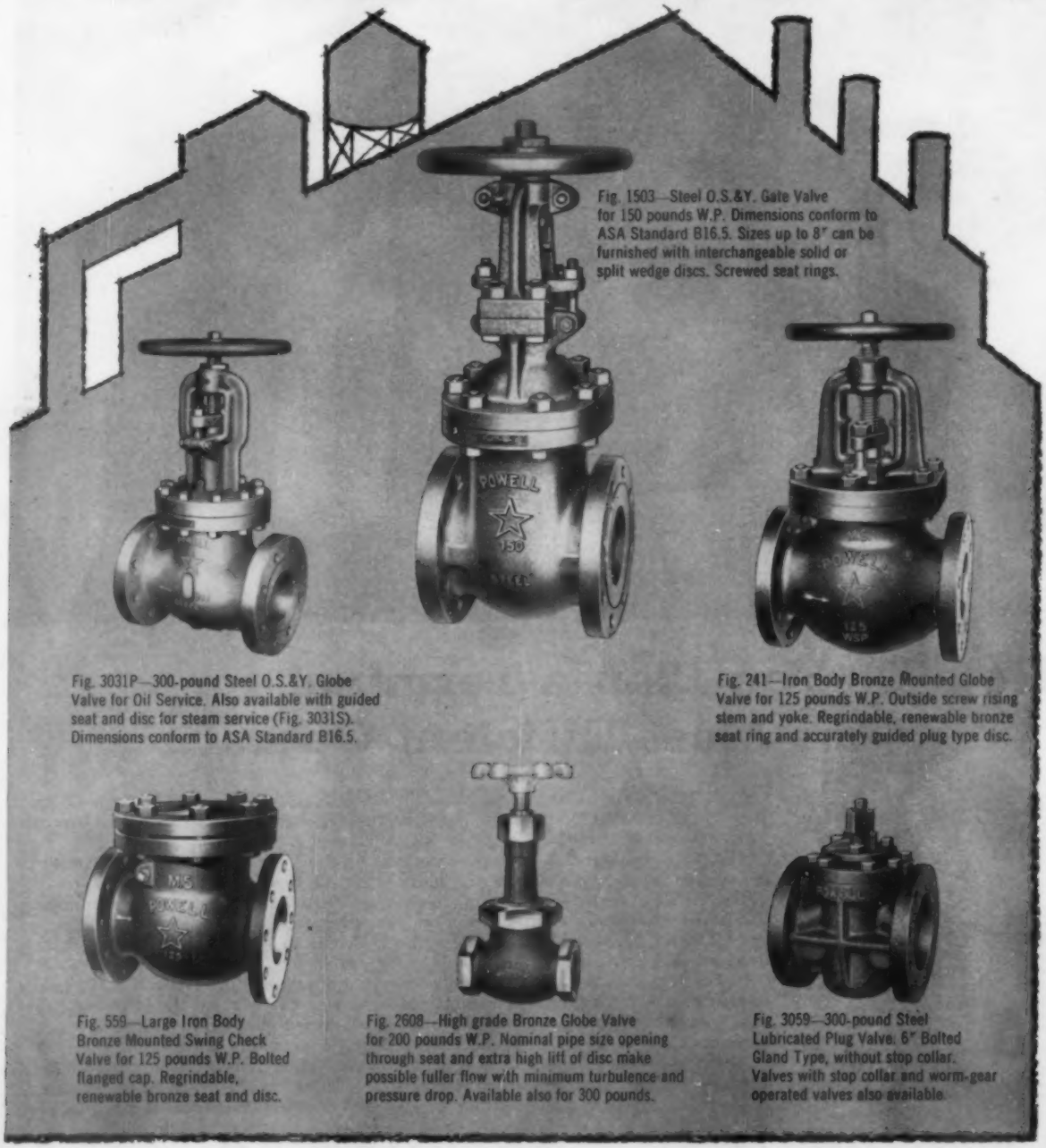

Fig. 1503—Steel O.S.&Y. Gate Valve for 150 pounds W.P. Dimensions conform to ASA Standard B16.5. Sizes up to 8" can be furnished with interchangeable solid or split wedge discs. Screwed seat rings.

Fig. 3031P—300-pound Steel O.S.&Y. Globe Valve for Oil Service. Also available with guided seat and disc for steam service (Fig. 3031S). Dimensions conform to ASA Standard B16.5.

Fig. 241—Iron Body Bronze Mounted Globe Valve for 125 pounds W.P. Outside screw rising stem and yoke. Regrindable, renewable bronze seat ring and accurately guided plug type disc.

Fig. 559—Large Iron Body Bronze Mounted Swing Check Valve for 125 pounds W.P. Bolted flanged cap. Regrindable, renewable bronze seat and disc.

Fig. 2608—High grade Bronze Globe Valve for 200 pounds W.P. Nominal pipe size opening through seat and extra high lift of disc make possible fuller flow with minimum turbulence and pressure drop. Available also for 300 pounds.

Fig. 3059—300-pound Steel Lubricated Plug Valve. 6" Bolted Gland Type, without stop collar. Valves with stop collar and worm-gear operated valves also available.

For every flow control problem Powell offers more kinds or types, available in the largest variety of metals and alloys to handle every flow control requirement. Powell distributors are located in all principal cities and maintain inventories to fill almost any need. For special engineering problems, write direct to:

THE WM. POWELL COMPANY • *Dependable Valves Since 1846* • **Cincinnati 22, Ohio**

OPERATION PROVES
It's Cleaner Gas with
PEERLESS
SCRUBOSPHERES

Operation of these four 66" I.D. Scrubospheres has demonstrated their superiority over conventional oil bath dust scrubbers. The dust removal ability of the SCRUBOSPHERE is outstanding because it utilizes wetted surfaces for dust collection which are more closely spaced than in conventional equipment.

Operation of these Peerless units has also proven their superiority with respect to minimum oil loss, because oil is periodically removed from the Scrubospheres whereas **it must be periodically added to other scrubbers** in the same plant operating under comparable conditions. Patent applied for.

Let your Peerless Representative give you full details.

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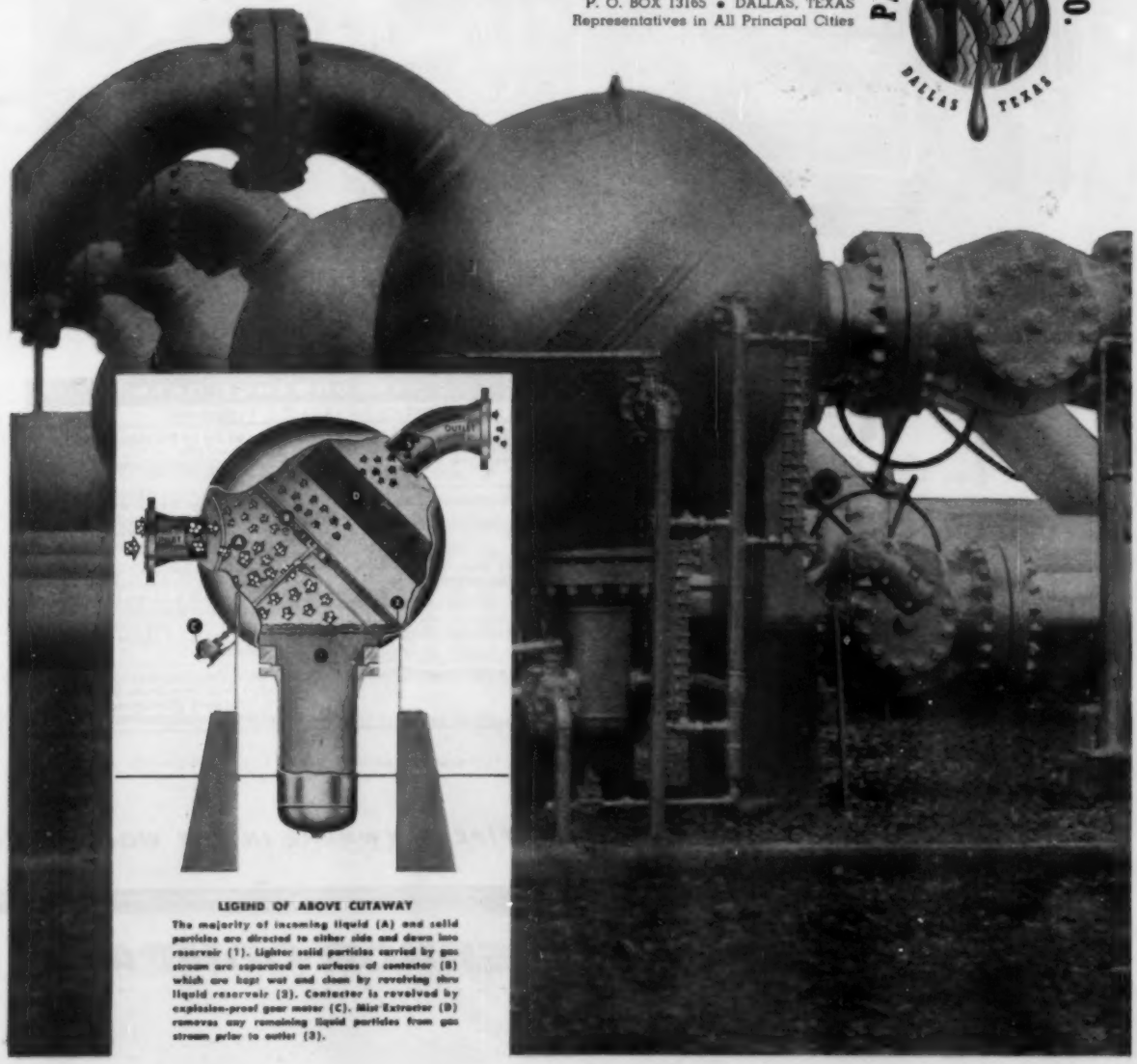
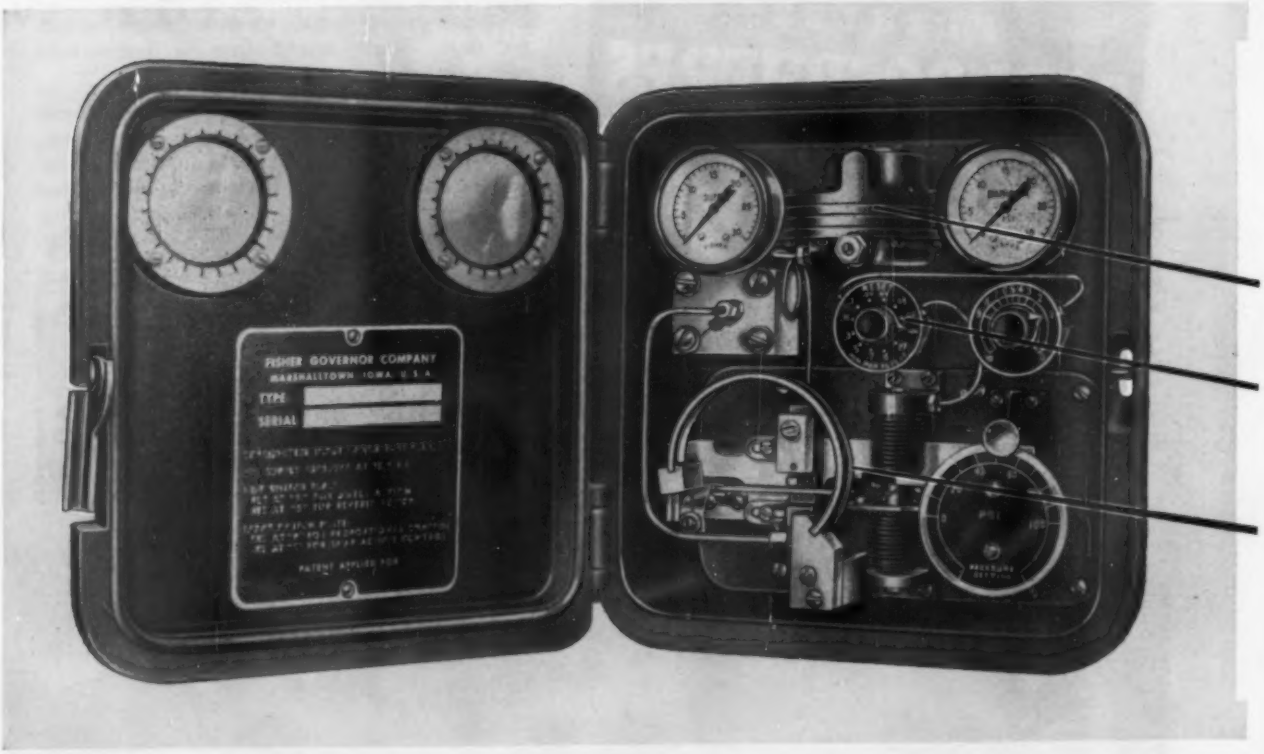
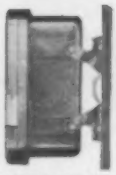


LEGEND OF ABOVE CUTAWAY

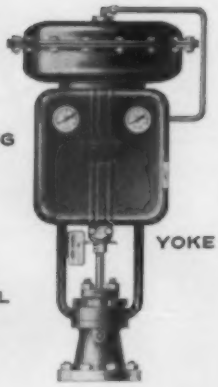
The majority of incoming liquid (A) and solid particles are directed to either side and down into reservoir (1). Lighter solid particles carried by gas stream are separated on surfaces of contactor (B) which are kept wet and clean by revolving thru liquid reservoir (2). Contactor is revolved by explosion-proof gear motor (C). Mist Extractor (D) removes any remaining liquid particles from gas stream prior to outlet (3).

Basic Simplicity...faster





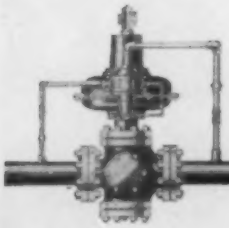
SURFACE MOUNTING



YOKE MOUNTING

FLUSH PANEL MOUNTING

PERFORMANCE DATA	
Test	**Results**
Air or Gas Consumption with 15 psi Output Pressure	Minimum at 10 or 0 Proportional Dial Setting—2 cfh Maximum at 5 Proportional Dial Setting—23 cfh
Resolution Sensitivity	Minimum Change Required in Measured Variable to Produce an Effective Movement of Final Control Element is 0.1% of Bourdon Tube Rating.
Repeatability	Ability of Wizard to Reproduce Its Output Signal for a Given Pressure Setting is 0.5% of Bourdon Tube Rating
Resonant Frequency	Unaffected at Usual Motor and Turbine Speeds.
Temperature Effects	Under Cold Box Test at —20° and Simulated Sun Test from 80° to 212°F Control Pressure Remained Within ±1% of Bourdon Tube Rating.



IF IT FLOWS THROUGH PIPE ANYWHERE IN THE WORLD...

FISHER GOVERNOR COMPANY

response...greater stability

the WIZARD II PRESSURE CONTROLLER

with New and Improved Features

1. **VOLUME RELAY** for faster response to pressure changes.
2. **RESET FEATURE** for greater stability and pin point control, assuring perfect metering, even on multi-stage meter runs.
3. **WIDE RANGE** brass, steel or stainless steel Bourdon tubes cover a range of from 25 to 10,000 psi. Bellows assemblies for low pressure regulation in ranges from 0 to 25 psi.

Again FISHER engineering produces features the industry needs to do a better job

The Wizard II has been designed to specifically meet the demands of modern, complex systems requiring closer control. The Wizard II retains all of the basic simplicity, accuracy and dependability of the Wizard 4100U, plus its own exclusive features.

The new design consists of two sub-assemblies encased in a weather proof die cast aluminum housing which is provided with a ¼" pipe threaded vent for gas service. Either assembly can be removed without disturbing line connections.

The upper assembly consists of two gauges, relay and proportional band adjustment. The lower assembly includes the set point adjustment, proportional bellows, Bourdon tube and nozzle. Each assembly is assembled and calibrated before mounting in the case. The case can be mounted on a flush panel, a wall or on the yoke of the control valve.

Careful and exhaustive tests have conclusively proved that the Wizard II measures up to rigid Fisher standards.

A completely descriptive and illustrated bulletin on the Wizard II is yours for the asking. Write for Bulletin No. D-4150.

The original Wizard I is still available for those applications not requiring volume relay and reset features.

CHANCES ARE IT'S CONTROLLED BY...

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POWER UNITS · GENUINE PARTS
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You can and do get service on Waukesha Oil Field Engines —when you want it, where you want it, how you want it. There's a Waukesha Oil Field Distributor, or one of his branches, near you. He has the set-up to give you top-notch service—experienced engineers and specially trained service men. And the genuine Waukesha parts you'll need, too. Look for the sign—stop in and see him.

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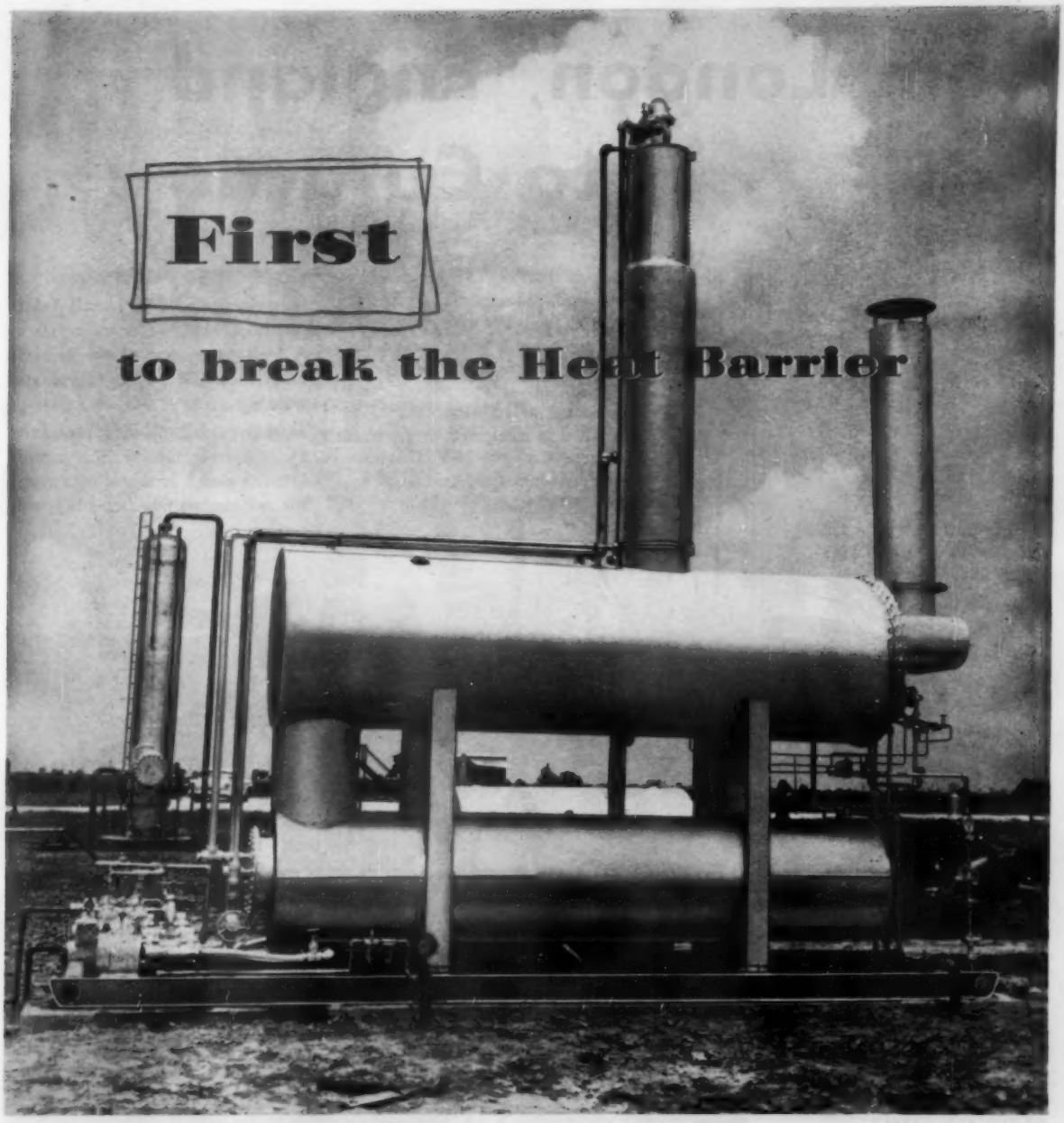

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1. Inlet temperatures to 140° F. 2. Guaranteed dewpoint depression as great as 105° F. 3. Regeneration of triethylene glycol to 99.7% by weight by Super-Dryer with reboiler operating at atmospheric pressure. Your Parkersburg representative can tell you about the new Parkersburg Glycol Dehydrator with Super-Dryer. See him TODAY!

THE PARKERSBURG RIG & REEL COMPANY
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Production Equipment Division Offices: P. O. Box 13295, Houston 19, Texas **Patents Pending*

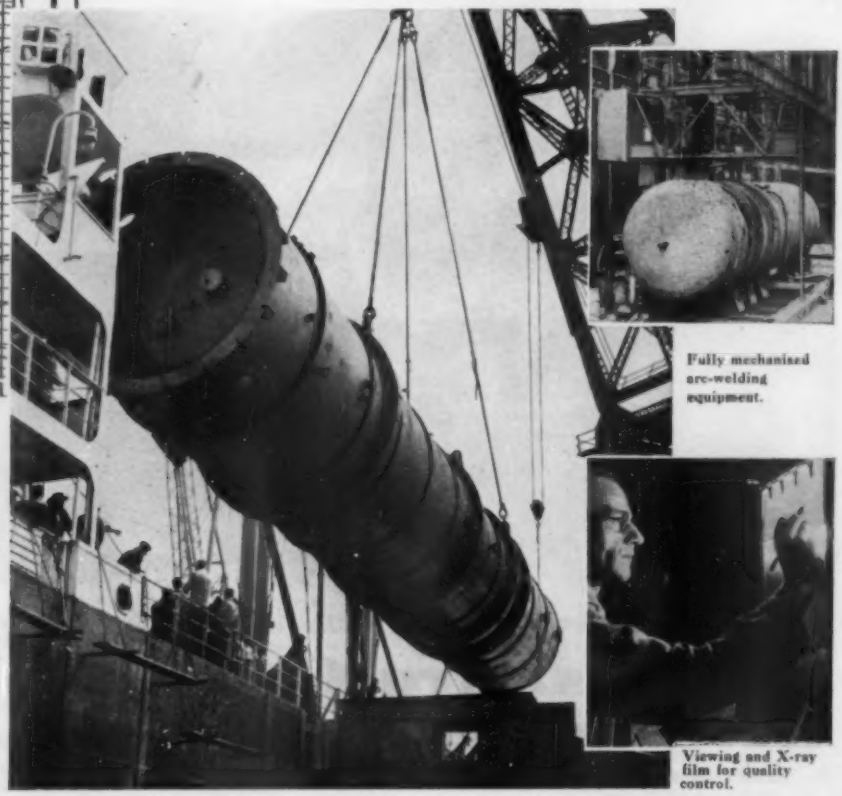
From London, England to Curacao

Harvey's service to the world's petroleum industry is strikingly shown in this view of a giant fractionating column being loaded for shipment. Measuring 142 ft. by 21 ft. 6 in. o/a diameter, and constructed of stainless clad M.S. plate, it was fabricated throughout by Harveys for the N.V. Curacaosche Petroleum Industrie Mij., refinery expansion programme at Curacao.

NOTE THESE POINTS—

Harveys are able to handle fabrications up to 120 tons in one piece. A high percentage of the fabrication is carried out by automatic welding.

Stationary and mobile X-ray units are supplemented by the use of Gamma and Ultrasonic equipment for non-destructive inspection and testing.



Fully mechanized arc-welding equipment.

Viewing and X-ray film for quality control.

Work fabricated in:

MILD STEEL
HIGH TENSILE
LOW-ALLOY STEELS
STAINLESS STEELS
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Vessels to Lloyds Class I, B.S.S. and A.S.M.E. Codes.

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SPECIALISTS IN THE PRODUCTION OF HEAVY WELDED FABRICATIONS FOR THE PETROLEUM INDUSTRY.

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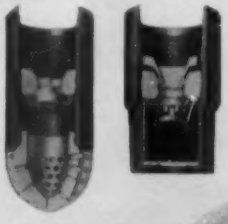
RECTOR TYPE "O" FILL SHOE and COLLARS HELP SET CEMENTING RECORD IN WORLD'S DEEPEST WELL

.....SAFELY!

PHILLIPS PETROLEUM CO. set two remarkable records with its world's deepest well, the 1-EE University in Pecos County, Texas, recently when it ran 22,919 feet of casing, the longest string ever run, and cemented a column 18,819 feet high in the hole, another record. And a Rector Type "OP" fill shoe with three Type "O" fill collars were used to help accomplish this amazing feat... *safely*... in a record overall time of 28 hours.

Whether your well is the world's deepest or a routine operation, the Rector Type "O" fill shoe is the *safest* you can use if there is any danger of sticking pipe. With the Rector Type "O" automatic fill shoe, you can stop running pipe and circulate the well as often and for as long as needed... and then resume running pipe with controlled orifice fill after circulating. Only Rector offers this exclusive safety feature.



Specify Rector equipment in your next cementing program. See your favorite supply store — or ask a Rector man for details.

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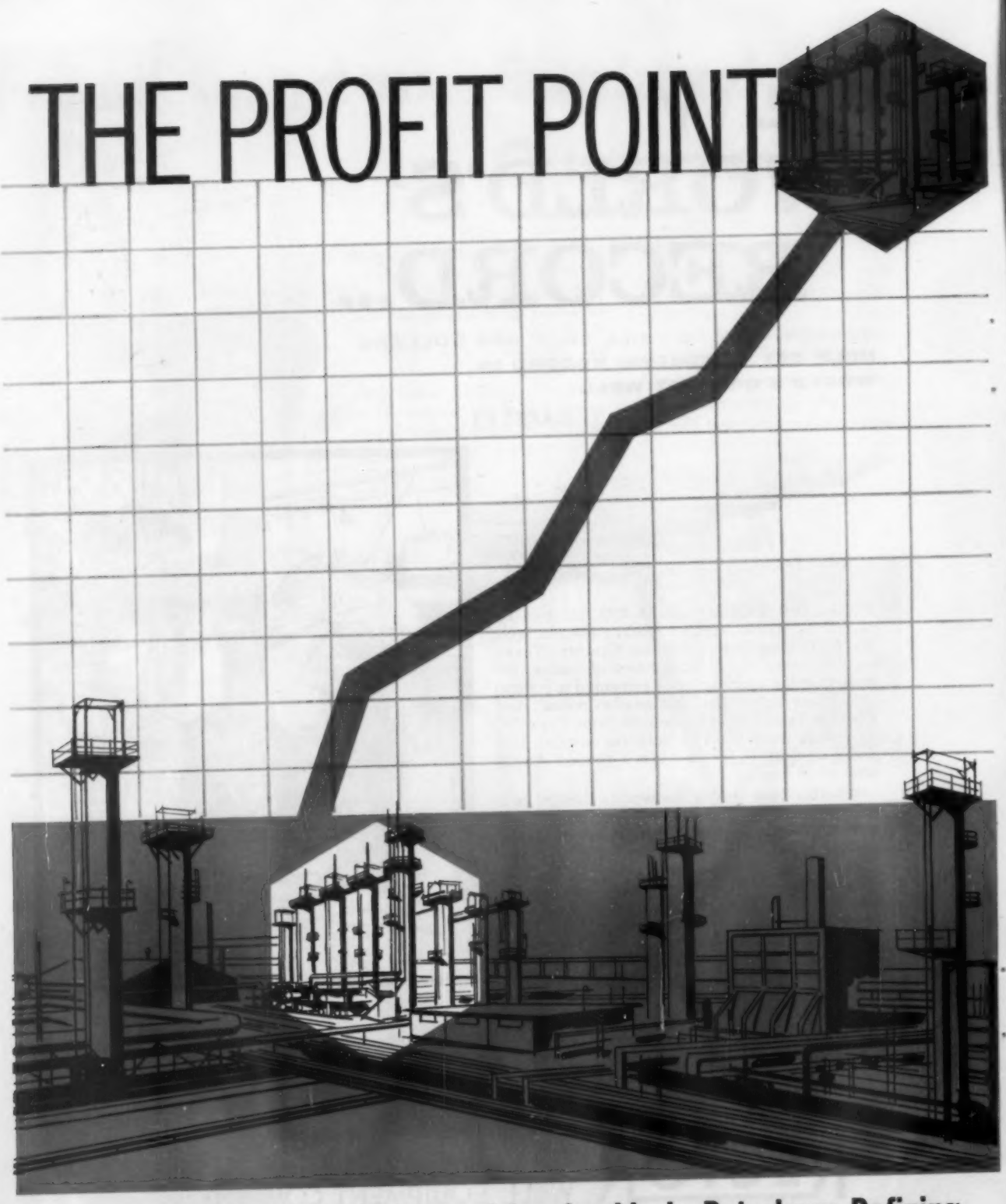

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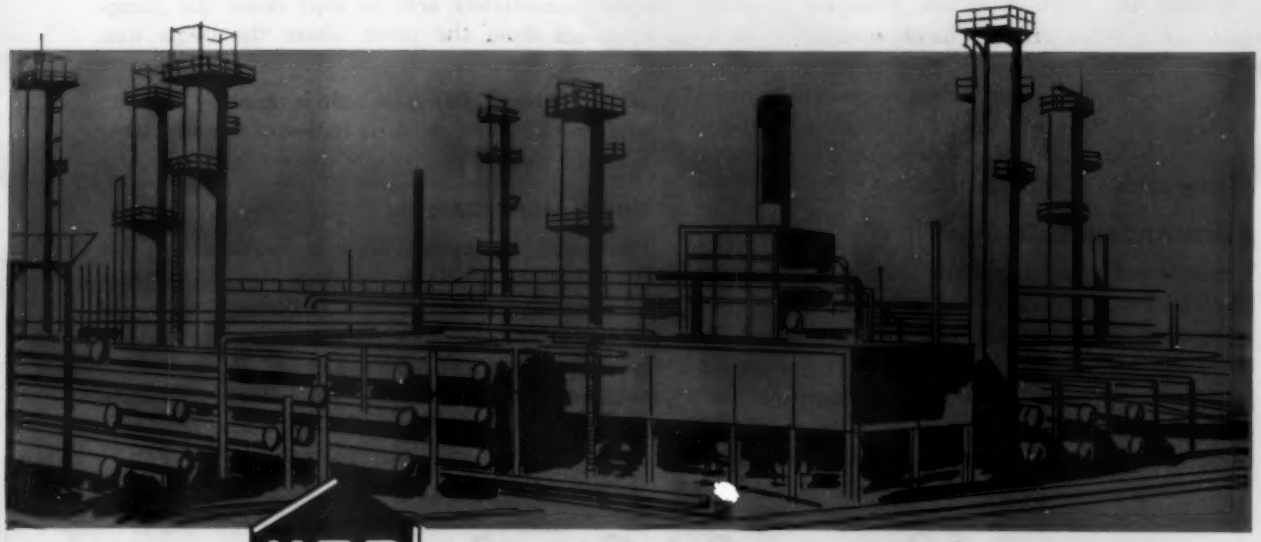
As every refiner knows, petroleum raw materials and refinery by-products yield valuable chemicals—a wide variety of petrochemicals for which there is a steadily growing demand.

With a relatively modest addition to existing facilities it is possible to effect a substantial increase in the dollar value of your products. Many refiners are doing just that—while at the same time upgrading their regular run of conventional petroleum products.

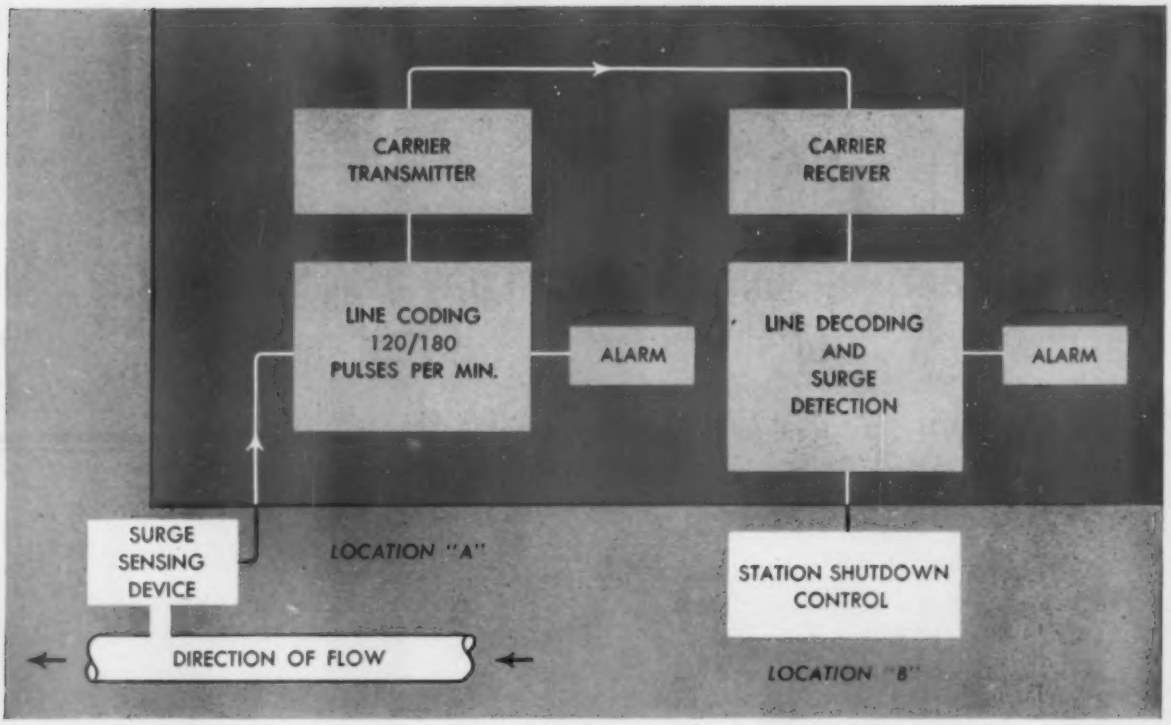
Find out more about the possibilities for your plant. Out of a broad fund of practical experience the UOP Petrochemical Process Department can bring you invaluable aid. In addition to furnishing detailed information on petrochemicals, they undertake special process and marketing studies which show you how to get into petrochemicals with maximum profit potential at minimum risk. Write today!



Technology UOP

UNIVERSAL OIL PRODUCTS COMPANY

30 Algonquin Road, Des Plaines, Illinois, U. S. A.



New! Union Surge-Purger

protects your pipeline from blowouts

PIPELINES ARE GETTING OLDER. Pumping stations are steadily being added to increase capacity. As a result, stresses on pipeline systems are becoming acute and blowout protection is needed. Union Switch & Signal has the answer—a new protection system that automatically detects surges and acts to stop them.

AUTOMATIC SHUTDOWN

The schematic diagram of the Union Surge-Purger Control System is shown above. Normally the equipment at Location B receives a steady 120-cycle code.

A severe surge causes this code to change to a 180-cycle "shutdown" code. The station shutdown equipment responds *only* to this special shutdown code, immediately acts to shut down the pump upstream from the point where the surge was detected.

If the "normal" 120-cycle code is upset by noise or equipment failure, an alarm indicates this situation. But only a surge can cause a shutdown.

SIMPLE AND RELIABLE

Practically no maintenance is required by this rugged all-relay control system. It will operate reliably for extremely long periods of time. Its dependability and self-monitoring features make it as foolproof as any control can be. This system is working to the complete satisfaction of leading pipeline companies in surge detection problems. Write to learn how it can help you.

"Pioneers in Push-Button Science"

UNION SWITCH & SIGNAL

DIVISION OF WESTINGHOUSE AIR BRAKE COMPANY

PITTSBURGH 18, PENNSYLVANIA

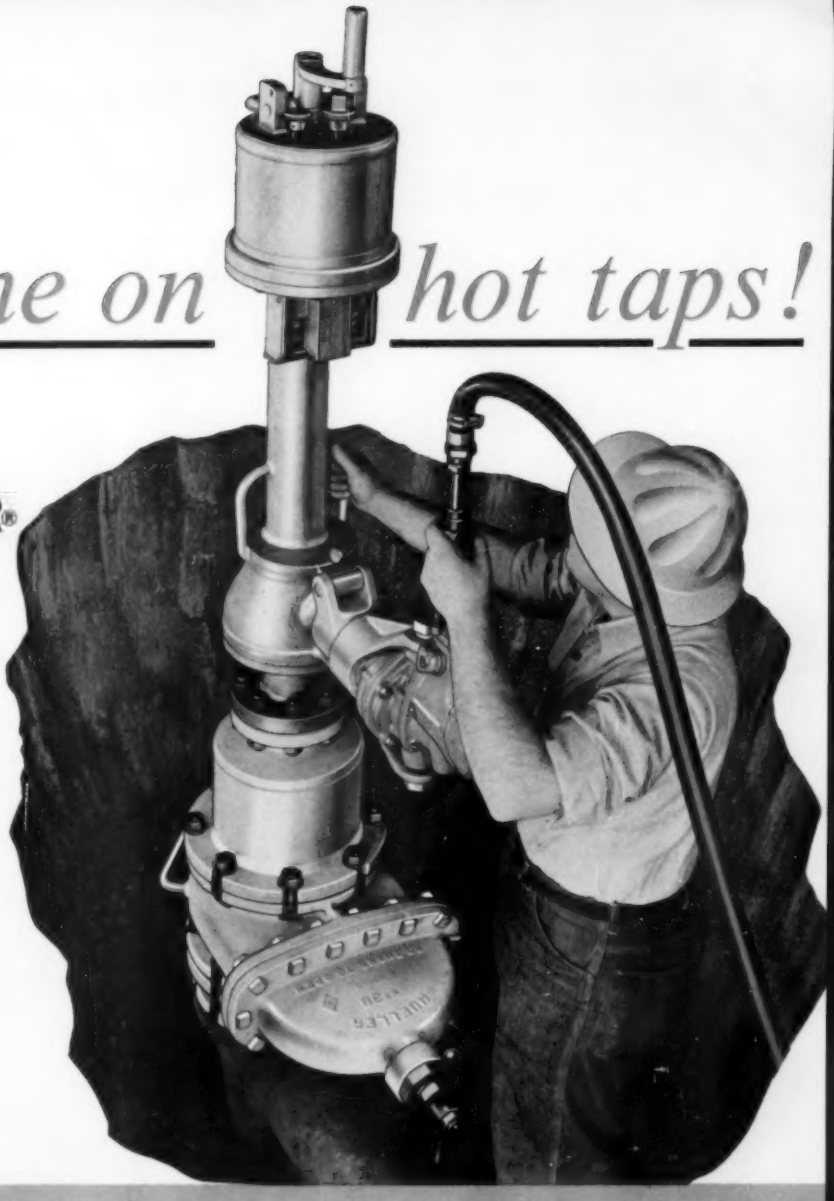
Save time on hot taps!

Use the all-new

MUELLER®

CH-6

Drilling Machine



Cutting out a section of pipe with the new Mueller CH-6 Drilling Machine prior to stopping-off the line.

Mueller Co. has developed a fast, automatic drilling machine for making cuts from 2" through 6" under pressures up to 1440 p.s.i.

The new CH-6 Drilling Machine may be hand operated with a ratchet handle or power operated with the Mueller H-601 Air Motor or H-602 Gasoline Engine Drive Unit. No changes in the machine are required to use either method of operation. And the cutting speed of the "CH-6" is much faster than older machines.

New design and new features reduce set-up and operating time, too. Standardized tools are used with any type of pipe to reduce selection and inventory problems. Total on-the-job time is drastically cut!

Turn the page for full design features on the new CH-6 Drilling Machine.

MUELLER NO-BLO MUELLER CO. Since 1857 QUALITY

MUELLER CO.

DECATUR, ILL.

Factories at: Decatur, Chattanooga, Los Angeles;
In Canada: Mueller, Limited, Sarnia, Ontario

Form No. PI-8877

Printed in U.S.A.

NEW CH-6 FEATURES

. . . a drilling machine designed to reduce your cutting time!

NEW! *self-adjusting boring bar packing*

Spring-loaded, high-temperature chevron packing.

NEW! *rugged all-steel construction*

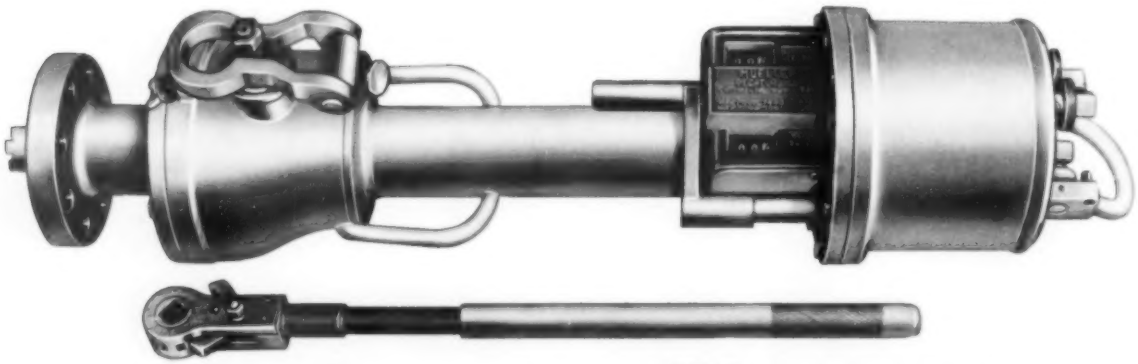
All working parts sealed in oil-filled, galvanized steel case with "O" rings.

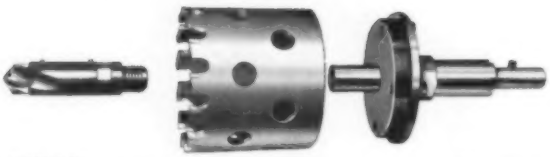
NEW! *power or hand operation*

No changes required to use ratchet handle, air motor or gasoline engine drive unit.

NEW! *handling ease*

Telescopic design and conveniently placed handles and lifting yokes.





NEW! *standardized tools*

Tungsten carbide tipped shell cutters designed to cut any type of pipe. Pilot drills screw into "E-Z-Release" type cutter arbors. Spring-loaded ball detent on pilot drill retains coupon.

NEW! *automatic tool position indicator*

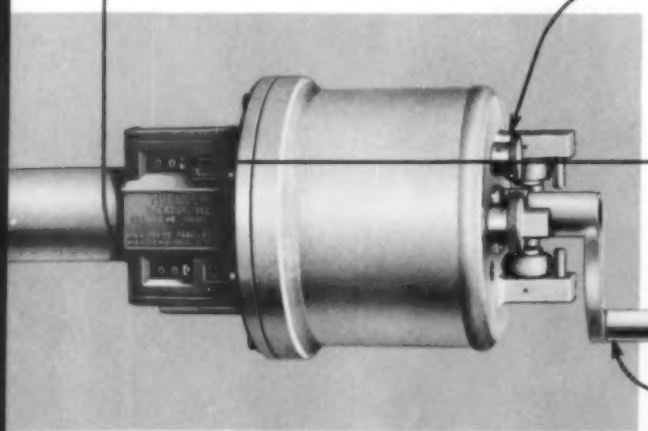
Automatically indicates position of pilot drill and shell cutter at all times. Large numerals read in inches and tenths.

NEW! *automatic overtravel protection*

Tool feed automatically disengaged whenever the maximum 24" travel is reached.

NEW! *automatic feed*

The amount of travel required in automatic feed can be quickly and accurately set in inches and tenths of an inch.



NEW! *automatic feed travel indicator*

Direct-reading indicator automatically shows amount of travel remaining in automatic feed.

NEW! *automatic feed disengagement*

Tool feed automatically disengaged when pre-set feed travel is completed and indicator reads zero.

NEW! *rapid hand travel*

When not cutting, boring bar may be quickly and easily advanced or retracted by hand. Direct shaft for normal pressures. Geared shaft for high pressures.

Check with your Mueller Representative or write direct for complete details.

NO-BLO

MUELLER CO. Since 1857 QUALITY

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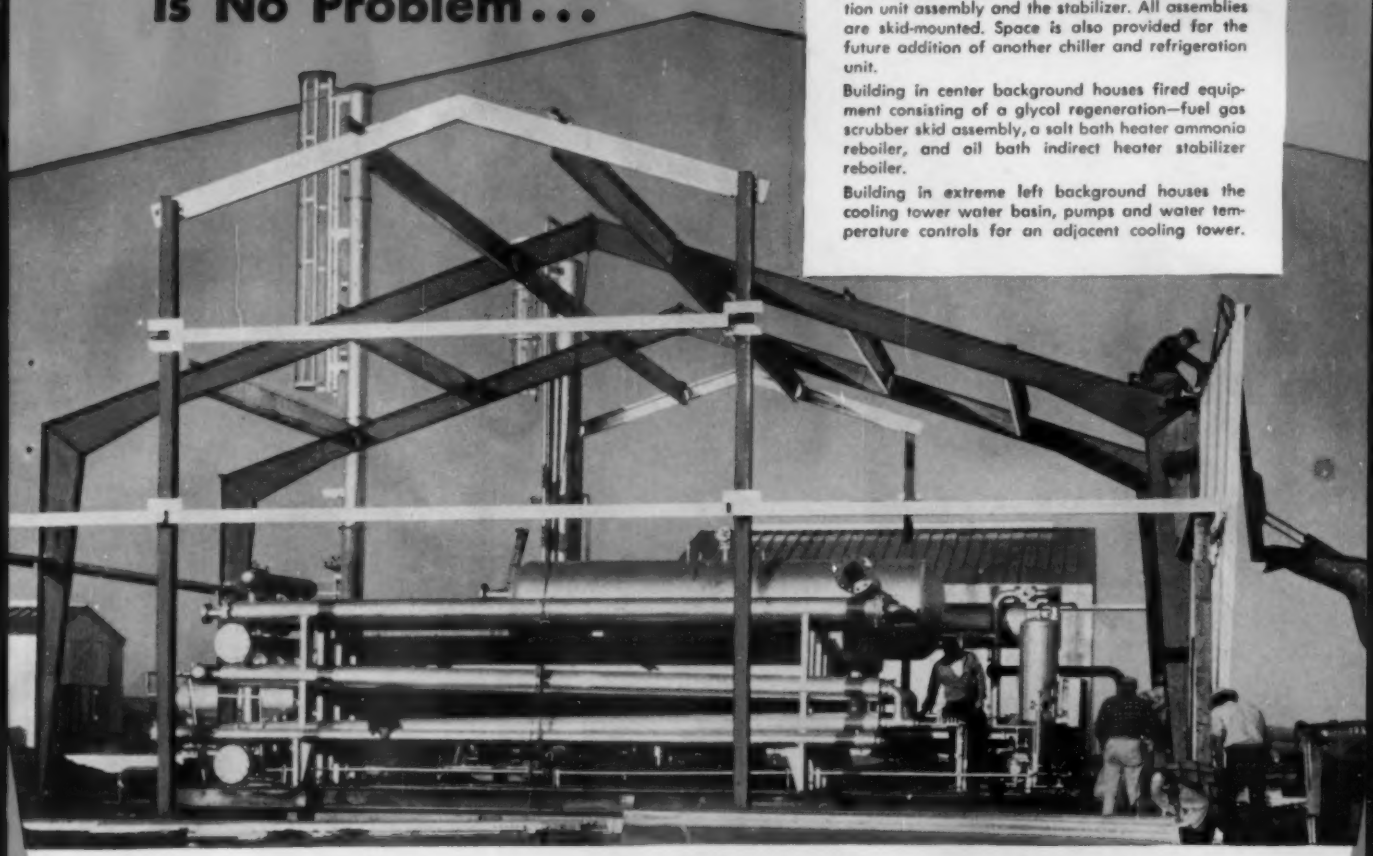
Factories at: Decatur, Chattanooga, Los Angeles; In Canada: Mueller, Limited, Sarnia, Ontario

Flow Rate Variation Is No Problem...



Partially completed building in the foreground houses the COLD-FRAC assembly, the chiller and pump gas scrubber assembly, the 66-ton refrigeration unit assembly and the stabilizer. All assemblies are skid-mounted. Space is also provided for the future addition of another chiller and refrigeration unit.

Building in center background houses fired equipment consisting of a glycol regeneration—fuel gas scrubber skid assembly, a salt bath heater ammonia reboiler, and oil bath indirect heater stabilizer reboiler.

Building in extreme left background houses the cooling tower water basin, pumps and water temperature controls for an adjacent cooling tower.

In This BS&B COLD-FRAC Gasoline Plant Built For Provost Viking Gas Unit

Approximately ten miles north of Consort, Alberta, Provost Viking Gas Unit recently put a new natural gas compression and dew point control plant on stream which *automatically* adjusts to variations in the flow rate of the inlet gas. BS&B designed and furnished all process equipment in this plant exclusive of compression.

Compressed gas at 800 psi is processed through BS&B COLD-FRAC low temperature separation equipment utilizing ammonia absorption refrigeration, to produce gas with 15° F. maximum hydrocarbon and water vapor dew points. A BS&B stabilization unit processes the condensed hydrocarbons to provide a 14# RVP gasoline.

The plant is presently equipped to process up to 44 MMSCFD, but future expansion has been provided for by the installation of a compressor suction scrubber and a low temperature separator designed to process up to 88 MMSCFD at 800 psi working pressure.

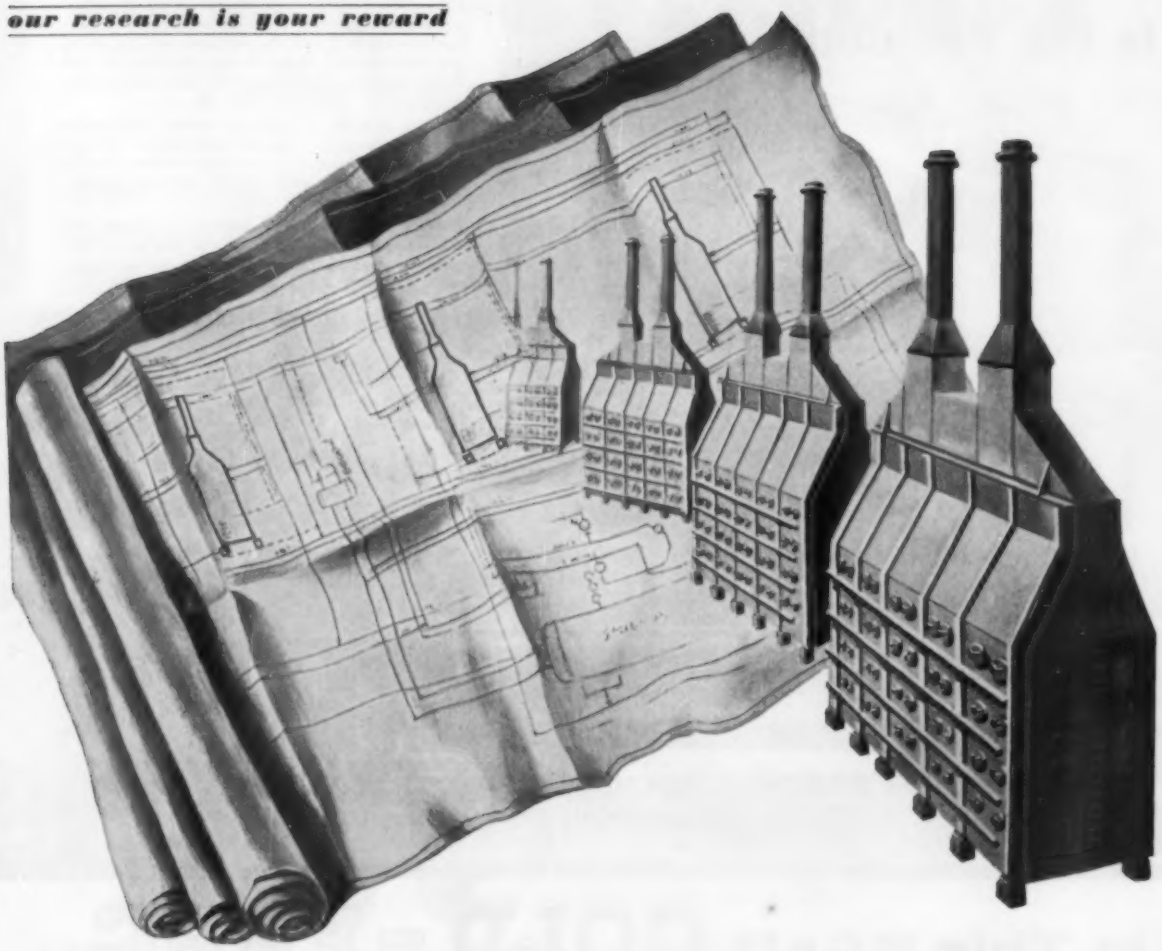
If your future plans call for the installation of a gasoline plant, why not talk it over with your BS&B Man? He'll gladly analyze the problem with you and will recommend the best combination of equipment to meet your requirements. Or, you may write to . . .

BS&B — Another Example of Product Leadership

BLACK, SIVALLS & BRYSON, INC.

P. O. Box 1714 — Oilfield Equipment Division, Dept. 1-A8A — Oklahoma City, Okla.

our research is your reward



73 Selas heaters in pyrolysis service demonstrate these extra benefits of Gradiation® processing

The difficulty in heat processing materials in conventional tubular heaters is to achieve uniform application of heat on the tube wall. Flame impingement or excessive heat on one side of the tube outer wall hastens metal degradation and, especially with highly corrosive feed stocks, tube corrosion.

Selas Gradiation overcomes that difficulty by distributing radiant heat uniformly along and around the entire tube wall, minimizing scaling and corrosion. Maximum allowable heat rate may thus be used in establishing coil length. The result: shorter lengths of tubes, fewer tubes, more compact furnaces. Obviously, tube replacement—when required—is less costly.

Selas heaters in pyrolysis service are designed to process a variety of feed stocks interchangeably. Burners are individually adjustable. Response to controller demands is split-second. This quality of Zone Control makes Selas heaters exceptionally versatile; makes them, as one processor has said: "The heart of the refinery."

Selas Gradiation heaters for the chemical, petrochemical and petroleum industries may be field-erected or shop-assembled. Selas also builds Econotherm* heaters for use where operations require materials to be heated to below decomposition temperatures.

Send for reprint "Try the Gradiation Heater for Economic Ethylene Production" and Bulletin 88 "Gradiation Heating for Petroleum and Chemical Processing." Selas engineers will be glad to discuss your heat-processing requirements with you. Selas Corporation of America, Dresher, Pa.

Gradiation is a registered trade name of Selas Corporation of America. * Trade Name

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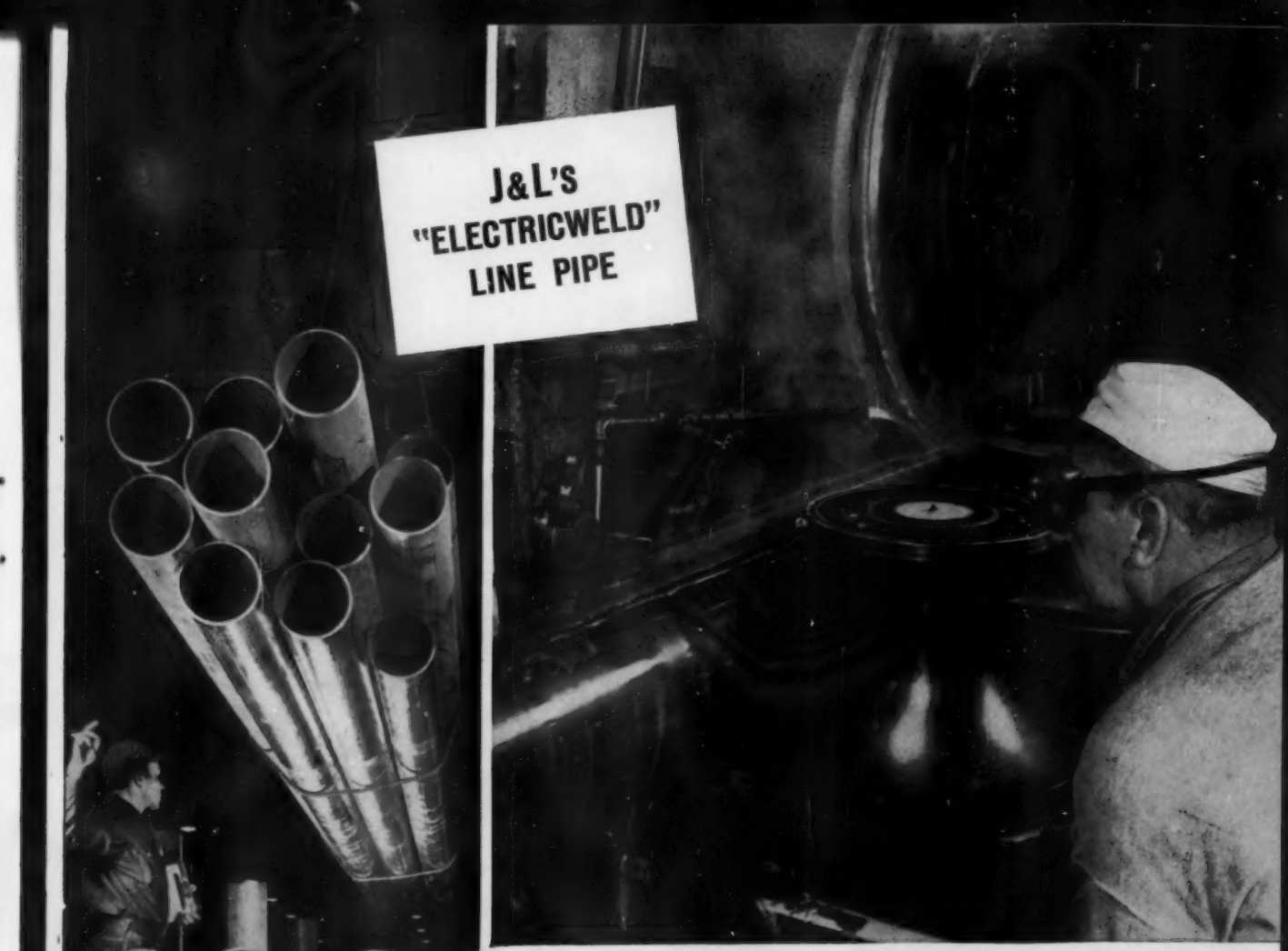
CORPORATION OF AMERICA
DRESHER, PENNSYLVANIA

Heat and Fluid Processing Engineers
DEVELOPMENT • DESIGN • CONSTRUCTION



"EVERY LENGTH QUADRUPLE-TESTED FOR UTMOST DEPENDABILITY"

Rigid quality control has top priority in production of J&L's Electricweld pipe for gathering, distribution and transmission lines.

Every length is pressure-tested under the specified A.P.I. or A.S.T.M. hydrostatic test requirement both in time and in degree of pressure. Lengths to 60 feet speed installation, reduce number of field welds.

Electricweld pipe is available from 6⅝ inches through 12¾ inches O.D. Electricweld line pipe is manufactured to appropriate A.P.I. and A.S.T.M. specifications.

In addition to **visual inspections,** each length of pipe is given a **crush test,** to determine weld strength and quality of steel. It is subjected to a pressure test on one of the largest and most modern **hydrostatic testers** in the world. As an additional precaution and assurance to the customer, Jones & Laughlin is giving both ends of each joint a **magnaflux examination.**

Get complete information on Electricweld line pipe from your J&L distributor or write direct to Jones & Laughlin, 3 Gateway Center, Pittsburgh 30, Pa.

J&L STEEL

Jones & Laughlin Steel Corporation

PITTSBURGH, PENNSYLVANIA

run it right . . . with quality engineered

BAASH-ROSS

Tubing and Hinged Casing Spiders

HINGED CASING SPIDER

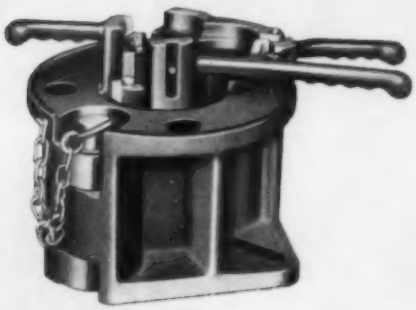
You can run the heaviest or lightest weight casing and tubing with Baash-Ross Spiders and Slips with no danger of crimping the pipe or losing the string when the slips are in place.

Made of high grade steel, Baash-Ross Spiders and Slips are available in sizes and types to meet every drilling and production requirement. Slips are unitized so that all surfaces grip the pipe evenly and firmly. The steep taper backs allow easy release.

- Hinged Casing Spiders have a working capacity of 200 tons with a 3 to 1 safety factor and openings to handle up to 20" casing.

- Type "TS 100" Tubing Spiders are adaptable to running single, double or triple tubing strings. An automatic, positive latch guards against accidental opening of slips for perfect safety, even while running multiple strings.

- Baash-Ross Open End Spiders are rated at 100 ton capacity to run the longest tubing strings with complete safety. These spiders are engineered to handle the newest type high alloy deep well pipe available. 10" long slips hold firmly with no danger of collapsing the pipe.



"TS 100" TUBING SPIDER

OPEN END TUBING SPIDER

Protect your next well with proven Baash-Ross Spiders and Slips. Be sure your file contains complete information on all Baash-Ross equipment. For additional details, see the Composite Catalog or write Dept. B 8-18, P. O. Box 1348, Houston 1, Texas.

BAASH-ROSS DIVISION
OF JOY MANUFACTURING COMPANY

BAASH-ROSS JOY

GENERAL OFFICES: 5300 CLINTON DR., HOUSTON, TEXAS

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FOREIGN OFFICES:

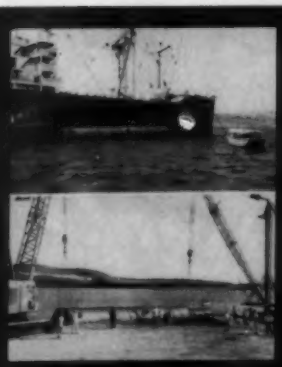
New York, N. Y.; Greenock, Scotland; London, England; Paris, France; Maracaibo, Venezuela; Buenos Aires, Argentina.

Here is the refinery Procon built for The Texas Company (West Indies) Limited 3 miles south of Santiago de Cuba. Inset shows complete refinery area early in construction period.

Creative Construction

how **PROCON** put it to work for Texaco in Cuba

Procon trained 85% of the Cuban workmen in construction technicalities.



Crude atmospheric column, prefabricated in the States, was floated ashore in 2 hours!—a saving of much time and cost.

Solid rock was encountered at a number of locations, required blasting to sink foundations, underground piping.

It's a pretty exacting business at best, building a refinery from scratch. Procon did this one the hard way, meeting and beating the challenges of: a site difficult for access by land . . . 85% of Cuban workmen needed training in technicalities of construction . . . applying the creative solutions to the problems shown in the pictures you see here. If you have a refinery in mind . . . or a petrochemical plant, or a chemical plant, or individual process units for any of these . . . you can be sure of top-flight construction, anywhere in the world, when you call on Procon to do the job.

PROCON *Incorporated*

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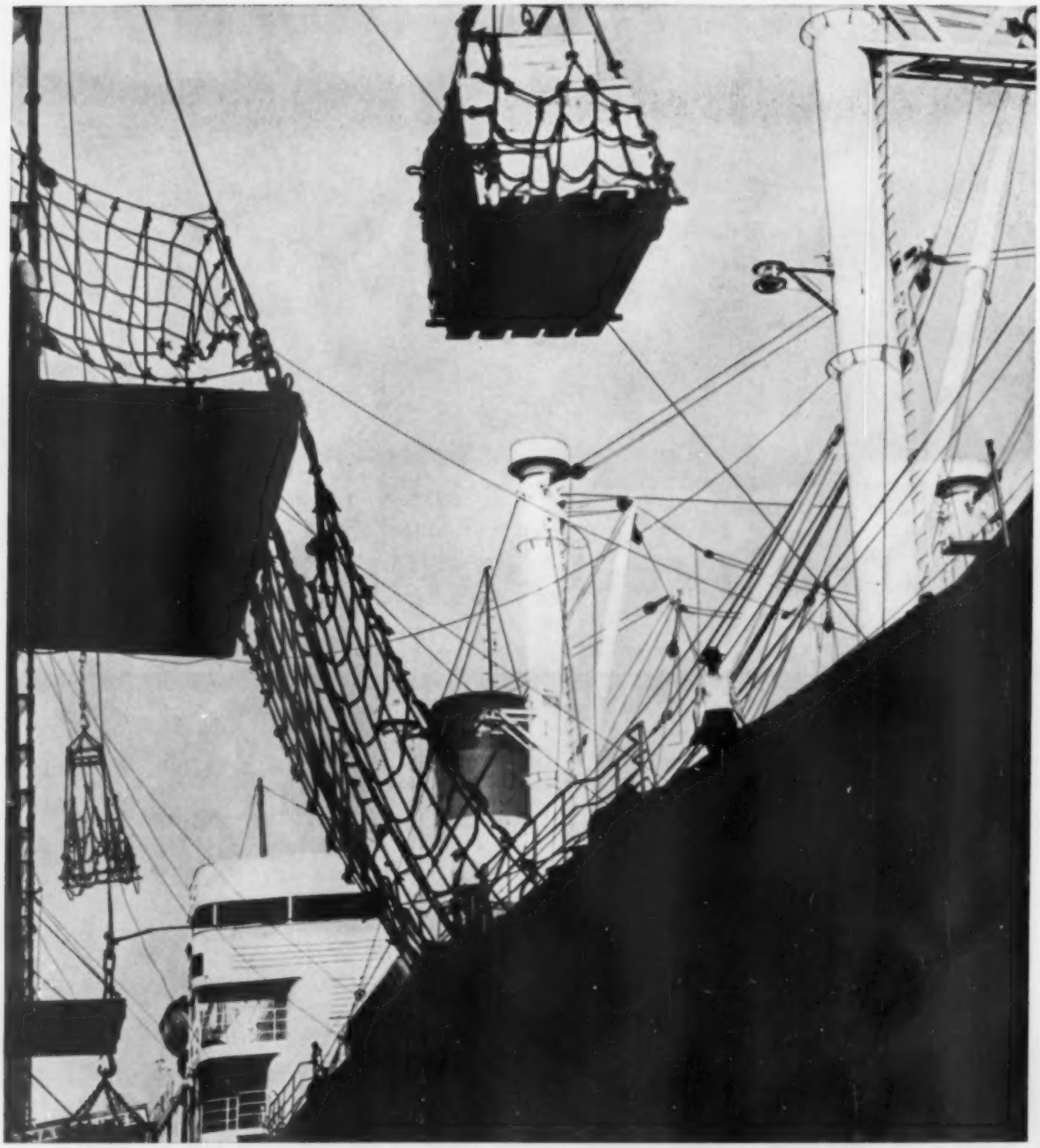
WORLD-WIDE CONSTRUCTION FOR THE PETROLEUM, PETROCHEMICAL, AND CHEMICAL INDUSTRIES



"The pace at which our neighbors' economic progress advances will determine—in increasing measure—our own rate of economic growth. Expanding trade in the free world is a must, and foreign oil is and will be a large factor in this activity."

M. J. Rathbone, President, Standard Oil Company (New Jersey)

ESSO

STANDARD OIL COMPANY (NEW JERSEY)

AND AFFILIATED COMPANIES

News and Notes on...

Good Packing Practice

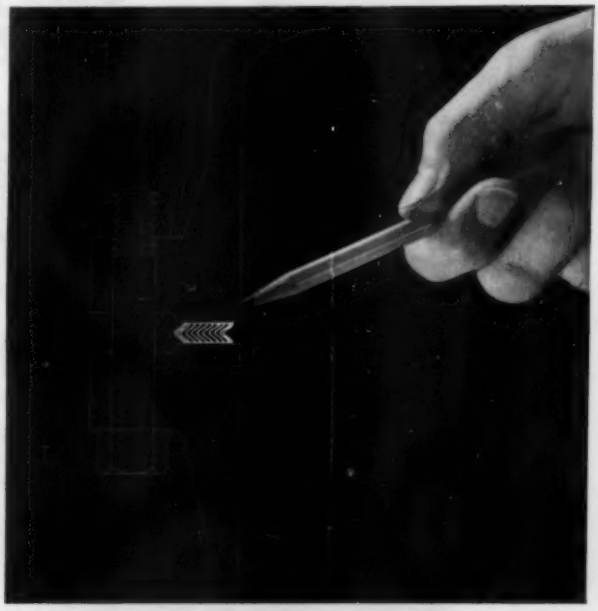
JOHNS-MANVILLE JM PRODUCTS

Maintenance and Design Hints from Johns-Manville Packings and Textiles Dept.

Subject of the month: Selecting the Gasket

Question:

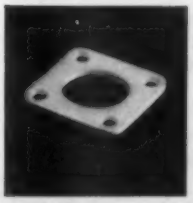
What are the important points to remember about gasket applications so we can avoid costly failure?



GASKET engineering is a complex study, but there are certain simple answers to this commonly asked question. Briefly, at least three variables must be considered. These are: 1. The available bolt force on the gasket. 2. Internal pressure and temperature. 3. The nature of the contained fluid.

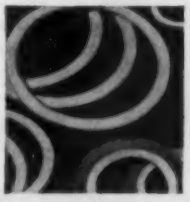
Starting with bolt force: it must be adequate to flow the gasket material and cause it to yield and seat effectively. Secondly: the bolt force must also always be sufficient to exceed the internal pressure and temperature forces that work against gasket closures. Finally: the gasket material must be impervious to the action of the confined fluid.

For service at low to medium temperatures and pressures: As a rule of thumb, if multiplying the operating pressure (psi) by operating temperature (°F) results in a product not exceeding 250,000, a quality "general service" type gasket can be used with complete safety. An outstanding gasket material for these operating conditions is J-M Service® Sheet #60 . . . a tough, durable compressed asbestos sheet. Service Sheet seals effectively against hot or cold water, steam, oils, mild acids and caustics.



If corrosive fluids are encountered: The best solution to the constant attack of chemicals and solvents is a gasketing material that is chemically inert. For this kind of service condition, Johns-Manville Teflon* Chempac® Gaskets are recommended. They are available in pure Teflon, low-flow (glass-filled) Teflon, Teflon-Asbestos, and in metal-Teflon combinations.

*TM for DuPont Tetrafluorethylene resin.



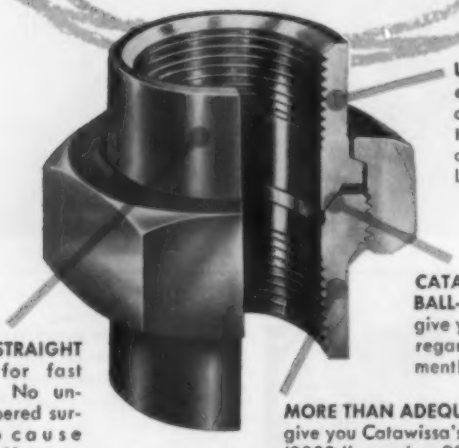
When extreme pressures and temperatures act on the gasket: If internal pressures reach 1200 psi or temperatures exceed 850°F, safe practice calls for a sturdy gasket that offers the high resiliency needed to follow expanding and contracting movements of flanges. For standard flange applications to 6,000 psi, you will find metal-asbestos, spiral-wound Goetze Spirotallic® gaskets most efficient. They offer high mechanical strength and resilience. Their special interlocking design and stainless steel construction is especially designed to effect and maintain a tight seal despite wide pressure and temperature variations.

To solve any sealing problems, call your J-M Packings and Gaskets field representative. He's equipped to give you information on new products . . . engineering and design advice. For information on any J-M Packings or Gaskets write Johns-Manville, Box 14, New York 16, N. Y. In Canada: Port Credit, Ontario.

JOHNS-MANVILLE

100 YEARS OF QUALITY PRODUCTS . . . 1858-1958

only
CATAWISSA
gives you all these features for your forged steel pipe union requirements



UNIFORM WALLS for even expansion and contraction under temperature changes. THEY FOLLOW THE PIPE!

CATAWISSA BALL-TO-ANGLE SEATS give you a "Perfect Seal" regardless of pipe alignment!

ROUND, STRAIGHT BARRELS for fast wrenching. No uneven or tapered surfaces to cause wrench slips or wrench locking!

MORE THAN ADEQUATE wall thicknesses give you Catawissa's 3-to-1 Safety Factor (3000-lb. service, 9000-lb. test; 6000-lb. service, 18000-lb. test)!

Catawissa Perfect Seal Pipe Unions are made by Union Specialists from 80,000-lb. tensile strength steel (ASTM Spec. A-105-55T, Grade II). Steel forgings from our own forging mill are closely checked for imperfections . . . and finishing on modern, automatic machines with close inspection during and after production give you pipe unions second to none!

Get your free copy of Catalog 56 showing the complete Catawissa line . . . write direct or stop at your favorite supply store.

CATAWISSA VALVE & FITTINGS COMPANY • CATAWISSA, PENNA.

for complete, guaranteed pipe union satisfaction

. . . always specify
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They Say—

OGJ succeeds in classroom

Dear Sir:

The summer term has only one more week to run; and for my class, only one more issue of the Journal. The use of your publication has been quite successful, at least from my viewpoint.

One thing is very clear, the best results cannot be obtained with a text book and lecture notes alone. Additional material, such as the Journal, is necessary.

It fits so well because it's a weekly publication, thus having the advantage of being constantly present. Another advantage is that the student gets to see the industry he may enter and become acquainted with it long before he graduates. This might be considered a small item by some, but I think it's on the plus side in building confidence in the undergraduate.

William R. Higgs
Assistant Professor of Geology
Louisiana Polytechnic Institute
Ruston, La.

Trials of the oil finder

Dear Sir:

The "cycloneology" concept (OGJ, July 28, p. 82) has been reviewed with interest in our study group, and as a corollary to this revolutionary hypothesis, perhaps your readers would be interested in some principles developed by us from our well-sitting experience. We respectfully submit them for industry use in long-range exploration programs.

1. Any location adjacent to a smooth, all-weather highway, near a sizable town offering good living accommodations, may be predicted to be a dry hole.

2. Any location 25 miles off the highway may be predicted to be a significant discovery if: (a) The lease road passes through sand dunes in dry weather, or (b) the lease road crosses bottom land in wet weather.

3. New horizon discoveries can be anticipated in development areas after a survey of local conditions reveals that: (a) There is only one small cafe in four townships, and the owner fries everything in elderly grease, or (b) the 1902 model mattresses in the hotel have springs capable of ripping live meat from one's back. (Combining these factors invariably leads to multiple completions in depleted areas.)

There are, of course, apparent ex-

Copon Arocoat—the Proven Epoxy-Coal Tar Coating

Unique formula cures quickly into a tough, tightly bonded, abrasion resistant shield against corrosive chemicals and fumes.

Copon Arocoat, the newest member of the Copon line of coatings specifically designed for corrosion control, is providing new answers for many of industry's toughest and most expensive corrosion problems.

Arocoat has been used profitably to cut traditional corrosion losses in paper mills . . . to add new life to condensate tanks and vessels, hopper cars, casing and conveyors . . . to provide internal or external protection for acid, alkali, sour crude and brine storage tanks . . . to reduce maintenance costs on cooling tower equipment. Economically applied by spray or brush, it has also been used to provide superior protection for marine equipment and submerged, buried and exposed gas and petroleum transmission lines.

If you have a corrosion problem that seems to defy profitable solution, get complete information on Copon Arocoat. Write today to the Copon Associate located nearest to your city.

Copon.

FOR CORROSION CONTROL

Normal Copon — the versatile maintenance coating • **Activated Copon** — for greater chemical resistance • **Copon Mastic** — high build for critical areas • **Copon Met-L-Pon** — the metallic zinc coating • **Copon High Bake** — the ultimate in chemical-resistant coatings.

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Mail to the Copon Associate located nearest your city.

_____Send complete information on Copon Arocoat.

_____I would like to discuss a corrosion problem with one of your technical representatives.

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TITLE_____

FIRM_____

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When You Want a TANK You Want It TIGHT And You Want It NOW!

TIGHTNESS: Columbian Bolted Steel Tanks stay tight because they "fit up" better and are equipped with the latest modern, proven sealing methods and materials for years of constant, trouble-free use. A complete line of Columbian Welded Steel Oil Field Tanks is fabricated to A. P. I. specifications.

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ceptions to these observations, but close scrutiny will invariably show close connection to one of the basic principles.

We may take the fabulous Oklahoma City field as one case in point. Here is an apparent anomaly—a large city with living and dining accommodations ranging from ordinary to superb and with transportation problems of no consequence. How could such tremendous production come about? Well, I'll tell you—national prohibition had developed to full flower and product quality at that late date had degenerated to such low degree that it was pure hell getting out to the lease, much less getting out of bed. That field just had to produce.

Respectfully submitted,
Hubert P. Siphuncle, President
The American Brachipod Society

Editor's note: Siphuncle is really Earl T. Peterson, Atlantic Refining Co., Tulsa.

Thanks for objective story

Dear Sir:

I have just returned from eastern Canada and have been catching up on my reading. I was very pleased indeed to see the story on page 64 of The Oil and Gas Journal for July 14 in connection with our proposed line to Montreal.

The purpose of this letter is to say how much we appreciate the careful and objective writing of this report. There has been a tendency to interpret our proposal as a battle between the independent producers and the Montreal refiners.

Ultimately we must have the Montreal refiners join with us as partners in this great project so we are very pleased at the treatment which this story received from your magazine.

James H. Gray
Manager of Public Relations
Home Oil Co., Ltd.
Calgary

Case of misplaced jealousy

Dear Sir:

I note by your article on page 61 of the August 4, 1958, issue that Senator O'Mahoney fears a new emergency oil lift.

He states that the proposed new plan "actually consists of a delegation to the private companies of the responsibility of the Government itself."

Let us hope that the learned Senator and a few others will suddenly become just as jealous of delegating to the

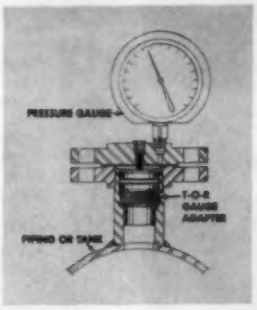
2 *Machines in* 1

TO INSTALL TEST EQUIPMENT ON PIPING IN SERVICE . . .

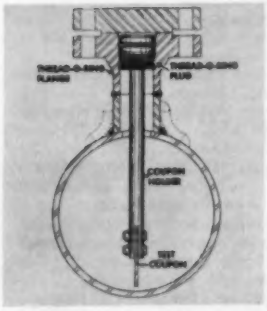
THE SAME MACHINE MAKES TAPS, INSTALLS AND REMOVES EQUIPMENT

4 TYPICAL USES

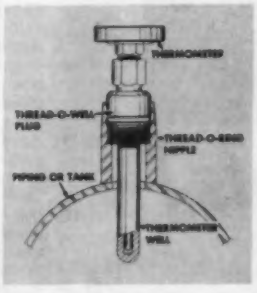
GAUGE ADAPTERS →

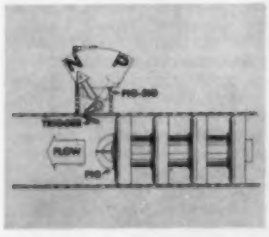


← CORROSION TEST COUPONS



THERMOMETER WELLS →





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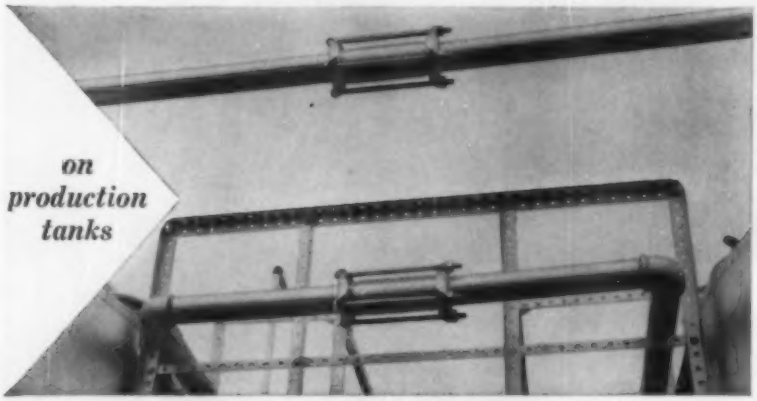

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R. T. Savage
Oklahoma City.

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

CALENDAR

AUGUST

18-19 North Dakota Oil and Gas Association, annual meeting, Grand Pacific Hotel, Bismarck, N. D.

18-20 American Institute of Chemical Engineers, American Society of Mechanical Engineers, second annual heat-transfer conference, Edgewater Beach Hotel, Chicago.

19-22 American Institute of Electrical Engineers, general meeting, Sacramento.

20-23 Alberta Society of Petroleum Geologists, eighth annual field conference, Nordegg, Alta.

25-27 Appalachian Gas Measurement Short Course, University of West Virginia, Morgantown, W. Va.

SEPTEMBER

6-7 Coating Society of the Houston Area, coating school, Hanna Construction Co., Houston.

7-12 American Chemical Society, fall meeting, Chicago.

10-12 National Petroleum Association, fifty-sixth annual meeting, Traymore Hotel, Atlantic City, N. J.

10-13 Intermountain Association of Petroleum Geologists, ninth annual field conference, Paradox basin.

14-19 Instrument Society of America, thirteenth annual instrument-automation conference and exhibit, Convention Hall, Philadelphia.

15-16 Independent Natural Gas Association of America, annual membership meeting, Roosevelt Hotel, New Orleans.

15-17 American Institute of Electrical Engineers, fifth electrical conference of the petroleum industry, Baker Hotel, Dallas.

18 Natural Gasoline Association of America, Rocky Mountain regional meeting, Gladstone Hotel, Casper, Wyo.

18-20 Rocky Mountain Association of Geologists, field trip, Maroon basin, registration, Glenwood Springs, Colo.

21-24 American Society of Mechanical Engineers, petroleum division, mechanical engineering conference, Cosmopolitan Hotel, Denver.

22-24 American Institute of Chemical Engineers, national meeting, Hotel Utah, Salt Lake City.

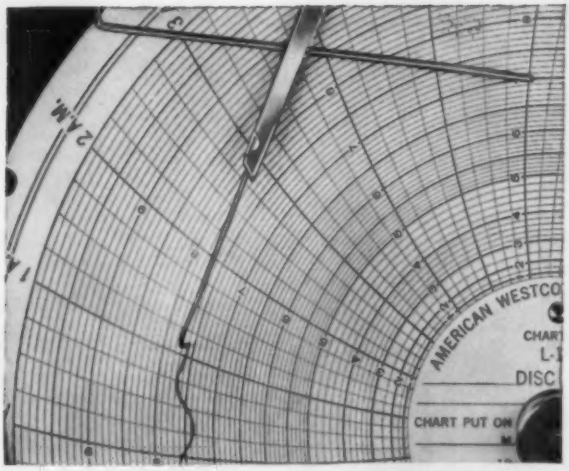
24-25 Western Petroleum Refiners Association, Rocky Mountain regional technical-industrial relations meeting, Henning Hotel, Casper, Wyo.

25 Manufacturing Chemists' Association, Texas Chemical Council, chemical industry safety workshop, Shamrock Hilton Hotel, Houston.

25-26 Mid-Continent Oil and Gas Association, Louisiana-Arkansas division, annual meeting, Roosevelt Hotel, New Orleans.

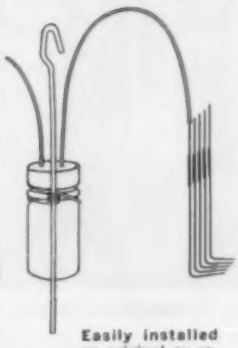
25-27 Illinois State Geological Survey, biennial petroleum engineering conference, University of Illinois, Urbana.

29-Oct. 3 Society of Automotive Engineers,



CANNON PENS

assure legible charts ...eliminate inking problems



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In Regular Size and Large Capacity Oversize

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Sand is deposited into blind cage above the plunger and is discharged every stroke of the pump. The bottom of plunger is sealed to eliminate slippage. Easy on surface equipment. Can be run in any API Seating Nipple.

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Tubular cup cylinder valve body with cage head and ball and seat firmly locked on top, with Grooved Seal cup rings or sure-tite positive lock cup rings, bronze wear rings firmly locked together with cup body nuts and gives greater strength and efficiency, easy on rods and surface equipment.

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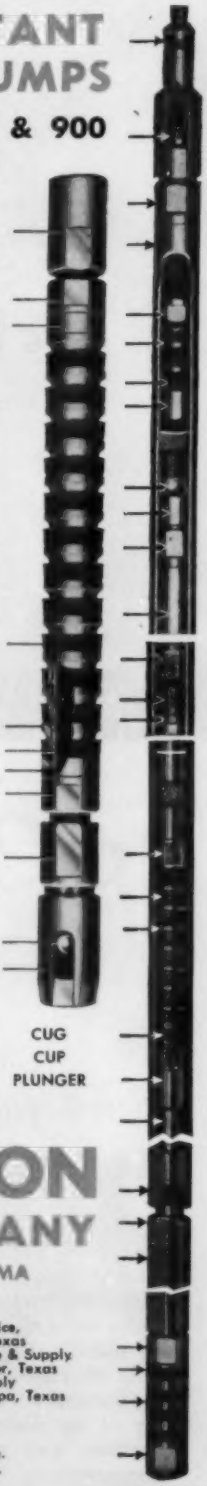

CUG CUP PLUNGER

Figs. 600 - 700
Figs. 800 - 900

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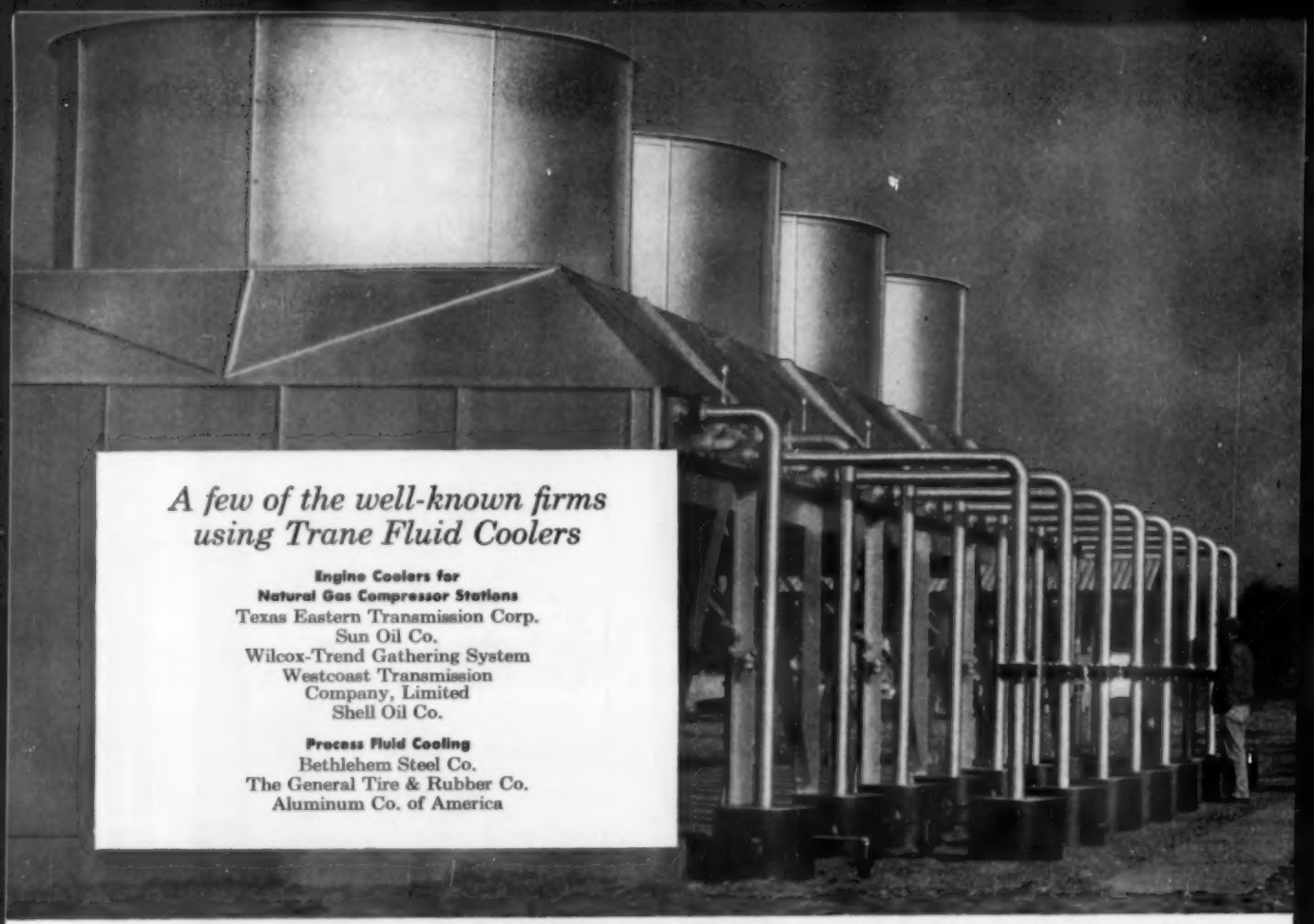

A few of the well-known firms using Trane Fluid Coolers

Engine Coolers for Natural Gas Compressor Stations

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Sun Oil Co.
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At this Tennessee Gas Transmission station in Clymer, New York, four TRANE

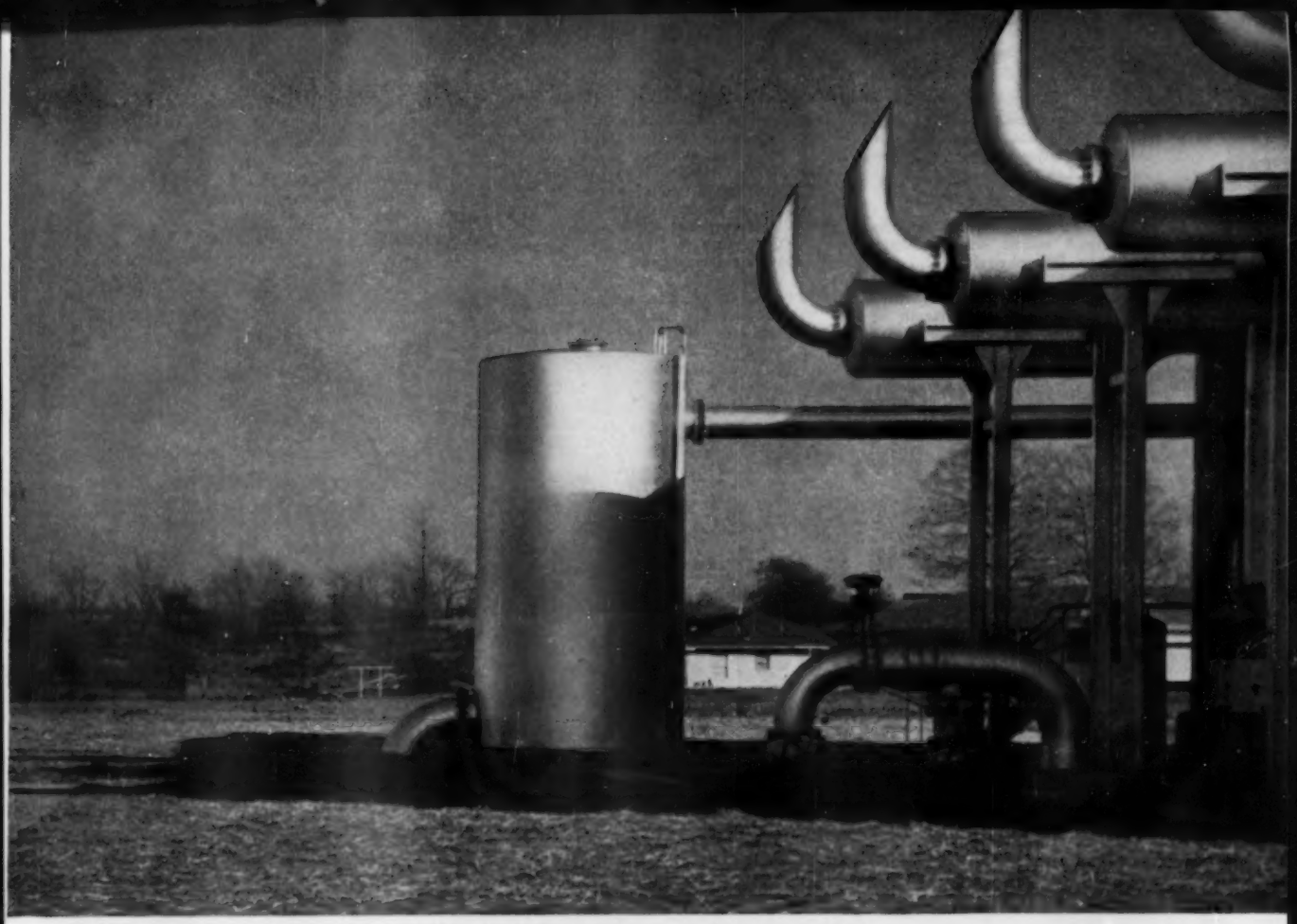
Tennessee Gas installs Trane

Induced draft units erected, tested and run-in at Trane laboratory before shipment

At Tennessee Gas Transmission Company's Clymer, New York station, four induced draft TRANE Fluid Coolers were installed to cool jacket water for four 2000 hp gas engine compressors. Before these units were shipped, they were erected and tested in the TRANE laboratories. Here, engineers were able to check all aspects of a prototype unit's performance—freedom from vibration, uniformity of air distribution through the heat transfer section, and every detail of workmanship and construction.

More and more major pipeline transmission companies are turning to TRANE for their fluid cooling equipment. Many have reported that TRANE Fluid Coolers are rugged, dependable, simply designed—with a minimum of maintenance and adjustment problems. And, with TRANE Fluid Coolers, engineers know that they can depend upon the accuracy and completeness of the capacity ratings. These ratings are based upon the industry's most complete laboratory testing—plus many years of field experience. Unlike many manufacturers, TRANE makes all its own coils—has had thirty years of experience in this highly specialized field.

When you have a fluid cooling problem, turn to TRANE! Call your nearby TRANE Sales Office, or write TRANE, La Crosse, Wisconsin.



Fluid Coolers are used to cool jacket water for four 2000 hp gas engine compressors.

Transmission Co. Fluid Coolers

Wind tunnel room in TRANE laboratory—"The House of Weather Magic"—where as many as ninety different temperature readings are taken across the face of a heat transfer section. In this laboratory, complete testing facilities are available to provide the data for rating the performance of every piece of equipment. Here, too, new TRANE products are developed and tested.

Controllable pitch propeller assemblies were supplied for this installation. Automatically hold fluid outlet temperatures to plus or minus 2°. Have fewer moving parts, bearings, controls . . . cut power costs as much as 50%. Fan, motor and drive are factory-aligned on a single metal base to cut installation time. All framework parts are pre-drilled and match-marked.

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national aeronautic meeting, aeronautic production forum, and aircraft engineering display, The Ambassador, Los Angeles.

OCTOBER

1-2 Western Petroleum Refiners Association, third annual stream-pollution and waste-disposal conference, Lassen Hotel, Wichita.

1-3 American Association of Oilwell Drilling Contractors, eighteenth annual meeting, Adolphus and Baker Hotels, Dallas.

3 American Institute of Chemical Engineers, South Texas section, thirteenth annual technical meeting, Moody Center, Galveston, Tex.

5-8 Society of Petroleum Engineers of AIME, fall meeting, Houston.

5-8 National Association of Corrosion Engineers, northeast region, Somerset Hotel, Boston.

7-8 Texas Mid-Continent Oil and Gas Association, annual meeting, Statler-Hilton Hotel, Dallas.

9-10 California Natural Gasoline Association, thirty-third annual fall meeting, Huntington-Sheraton Hotel, Pasadena, Calif.

10-12 Tri-State Oil Show, Roberts Municipal Stadium, Evansville, Ind.

12-18 OIL PROGRESS WEEK.

13-15 American Gas Association, annual convention, Atlantic City, N. J.

13-15 American Society of Mechanical Engineers, American Society of Lubricating Engineers, conference on lubrication, Statler Hotel, Los Angeles.

13-16 Society of Exploration Geophysicists, annual meeting, Hotel Gunter, San Antonio, Tex.

13-17 American Society of Civil Engineers, annual convention, Hotel Statler, New York.

15-16 South Dakota Independent Oil Men's Association, convention, Sheraton-Johnson Hotel, Rapid City.

15-16 University of Kansas, Southwest Kansas Center, sixth annual Gas Measurements Institute, Liberal, Kans.

15-17 National Association of Corrosion Engineers, north central region, Cincinnati.

16-17 Society of Petroleum Engineers of AIME, Southern California petroleum section, Biltmore Hotel, Los Angeles.

16-18 New Mexico Geological Society, Arizona Geological Society, ninth annual field conference, Black Mesa basin, registration Gallup, N. M., Oct. 15.

16-18 Permian Basin Oil Show, Odessa.

19-21 National Association of Oil Equipment Jobbers, annual convention and trade show, Hotel Adolphus, Dallas.

20-24 National Association of Corrosion Engineers, south central region, Roosevelt Hotel, New Orleans.

20-24 National Safety Council, forty-sixth National Safety Congress, Conrad Hilton Hotel, Chicago.

22-23 National Association of Corrosion Engineers, western region, corrosion control course, U. S. Grant Hotel, San Diego, Calif.

22-25 Southwestern Federation of Geological Societies, regional meeting, Mineral Wells, Tex.

22-24 Society of Automotive Engineers, national diesel engine meeting, Lord Baltimore Hotel, Baltimore.

23-24 Rocky Mountain Oil and Gas Association, annual fall meeting, Town House Motel, Omaha.

23-24 Western Petroleum Refiners Association, refining technology and industrial relations meeting, Rufus Garrett Hotel, El Dorado, Ark.

27-28 Independent Petroleum Association of America, annual meeting, Statler-Hilton Hotel, Dallas.

28-31 American Institute of Electrical Engineers, general meeting, Pittsburgh.

NOVEMBER

5-6 Society of Automotive Engineers, national fuels and lubricants meeting, Mayo Hotel, Tulsa.

6-7 American Association of Petroleum Geologists, Pacific section annual meeting, Los Angeles.

6-7 Louisiana Polytechnic Institute, School of Engineering, seventh annual instrumentation conference, Ruston, La.

10 Transportation Club of the Petroleum Industry, annual meeting, Bismarck Hotel, Chicago.

10-13 American Petroleum Institute, thirty-eighth annual meeting, Conrad Hilton, Palmer House, and Congress hotels, Chicago.

18-20 Ninth National Conference on Standards, Hotel Roosevelt, New York.

20-21 American Society of Civil Engineers, structural division and Kansas City section, conference on electronic computation, Kansas City.

21 Natural Gasoline Association of America, Panhandle Plains regional meeting, Herring Hotel, Amarillo, Tex.

On ungrounded 440 v. 3-phase systems

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WARNING

....before those hidden grounds become dangerous and costly!

By warning of trouble before it becomes serious, the DELTA-DESCO GROUND ALERT saves in many ways. Saves expensive motor rewinding, switch gear and transformers, and prevents crippling shut-downs.

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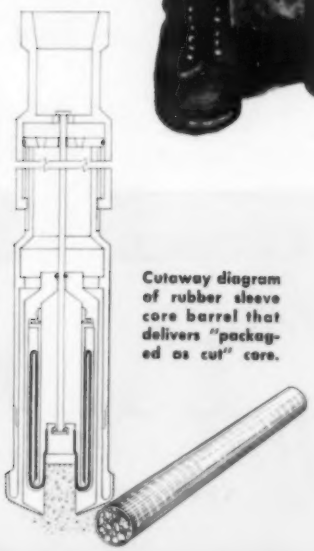

Cutaway diagram of rubber sleeve core barrel that delivers "packaged as cut" core.

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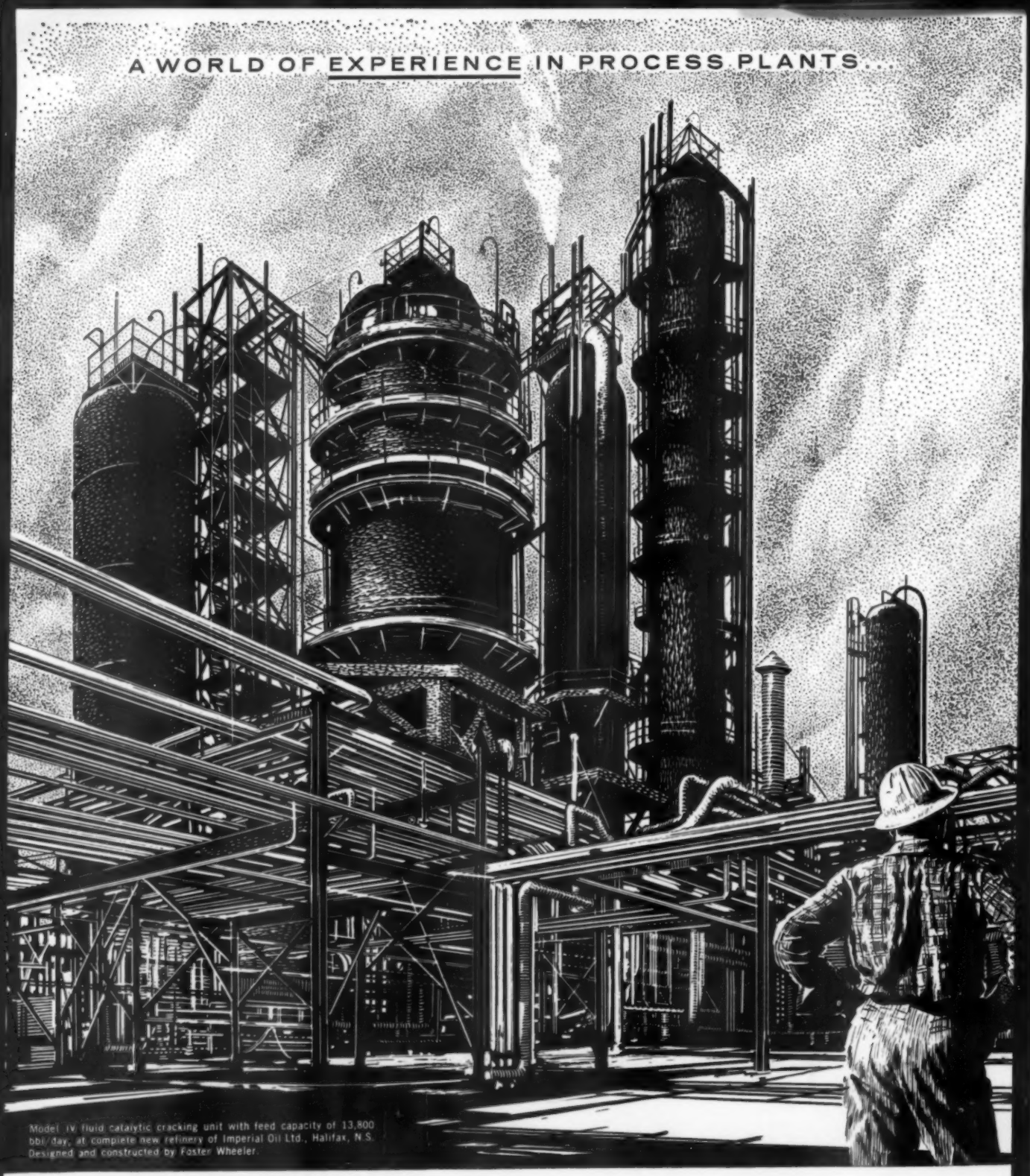

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TULSA, OKLAHOMA

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HARRY BECKER . . . . European Representative

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JOURNALLY SPEAKING

The Journal Said . . .

THE FACT that the oil industry is rounding out its first century has set a lot of people to poring over historical records, including Journal editors.

And the best and most fascinating accounts of what happened way back when, are the old bound volumes of our favorite oil publication itself.

So we decided to share some of our gleanings with our readers. The result is a new editorial feature: "The Journal Said. . .". For the time being you'll find it smack dab in the middle of the news section, though later it may find a home of its own in some other part of the magazine. This week it's on page 111.

What the Journal said 50, 25, and 10 years ago makes nostalgic reading for the old-timers in the business, and should intrigue the newcomers, too. It's amazing to see how much progress has been made in a few short years, and it's amusing to see what oil men were worrying about only yesterday.

One of the most charming (at least to us) aspects of this resurrection of the past is to note what was considered newsworthy half a century ago, and the relaxed style of writing employed. Nowadays the pressure on our white space and on our readers' time forces us (we feel) to omit all but the absolute essentials, and to present those in a terse, factual manner.

For instance, contrast our present "Personals" items with these gems from our pages of August 1908:

"Colonel W. S. Farish, the Goose Creek oil magnate, has taken a party of friends down to Rockport in a private car to do a few days' fishing. If he collides with Ott Holleron, now angling along Devil's river, it's a cinch there'll be some awful lying."

"Clint Heywood, one of the brothers who became wealthy in the oil business at Spindletop and Jennings, is the possessor of one of the finest trombones in the world. Mr. Heywood stopped at the Hotel Brazos (Houston) yesterday. . . The trombone is of solid gold, and diamonds are set in the bell."

Gasoline hadn't begun to cut much of a figure in the oil trade 50 years ago, but there was a big push to promote the use of crude (unprocessed or slightly topped) as fuel oil. The Journal observed in 1908:

"Various signs indicate that the Government is gradually getting awakened to the possibilities of petroleum for fuel purposes and other uses. In the Navy, the awakening as to the value of oil as a fuel is noteworthy. Experiments are now being conducted at the New York and Norfolk navy yards on oil burners for naval use."

On the other hand, some developments didn't come along very fast. In 1908 we reported: "Coalinga (Calif.) operators have incorporated under the laws of Arizona the West Coast Oil Company and have acquired about 500 acres of land in Jefferson County, Wash." We're still watching for that play to get hot.

Twenty-five years ago the industry was reeling under the flood of overproduction from East Texas and Oklahoma City fields, and the attempts of the federal Government to control it through the National Industrial Recovery Act (do you remember Ickes?). The Journal, disgusted with the failure of state governments to control the situation, editorialized:

"While state cooperation is necessary, the oil industry, from past experience, does not place any dependence upon state authorities in enforcing proration orders. It will be up to the federal authorities to hold production in the different states to the figures allocated."

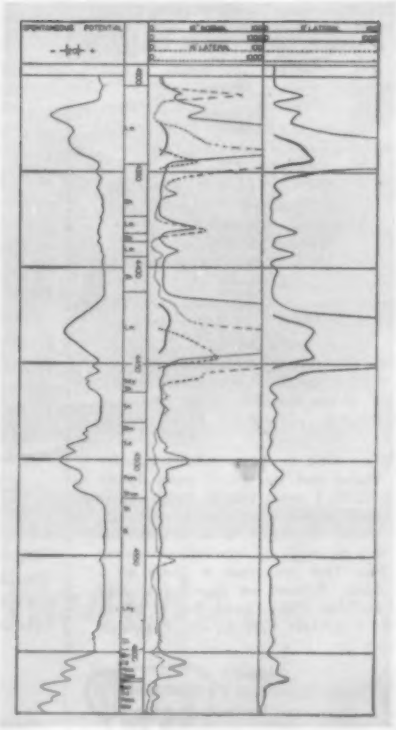
How wrong can you get?

We're sure you'll find this new feature interesting as it lifts the curtain of the past, week by week.

Of course, "50 Years Ago" columns are nothing new. Scores of newspapers and magazines carry them. But what publication except the Big Yellow Book could write one about oil out of its own files?

—Henry D. Ralph

PRODUCTION GUIDES



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Filed your import application yet?

HAVE you filed an application for a quota to import crude oil or refined products? If not, why not? Everybody else is getting in the act.

Look at the latest list of applications pending with the Interior Department. You don't need to have any capital invested in producing properties abroad, any foreign crude lacking other markets, any history of importing.

You don't need to have a refinery designed especially for a foreign crude, or even a refinery located where it might handle some. You don't need to have a refinery at all, or even be a marketer of products. You can just be an inland trucker and jobber of crude oil.

THIS IS GETTING PRETTY SILLY. Import quotas are sought by people who don't have any source of oil abroad nor any use for it when imported. Obviously many of them just see a chance to turn a fast buck by reselling the oil (or the permit) to others.

If this is going to go on, why not cut the cake thinner and give everybody a slice? Every domestic oil producer has a stake in the imports-control program. So, for that matter, does every automobile owner. Give each of them a quota for a couple of barrels and let him make a few cents by peddling it.

Now that the administration's so-called voluntary control plan has been validated and strengthened by the renewed reciprocal trade law, drastic changes should be made in the machinery for dividing the total allowed imports. And soon, because the old system is already getting out of hand.

When the program started it was confined to historic importers who had developed crude abroad and had established markets for it here. Then these were asked to move over to accommodate newcomers who could demonstrate some claim for a share of the total. As the process continued and applications snowballed, some of the claims are about as tenuous as one that could be filed by a taxi driver.

THERE ARE TWO WAYS OUT. The administration can back up and limit crude quotas to those who were importing before the program started. A prohibition on reselling crude or peddling quotas might limit applicants to refiners who can actually use foreign crude.

Or, if crude quotas are to be considered negotiable paper, adopt a certificate system something like that proposed in the Ikard bill. Assign quotas to all enterprises of a certain category (all refineries, for example) on a mathematical formula instead of just to those who apply.

The new problem of assigning quotas for refined products may require a different system. But something must be done to reduce the number of volunteers under the voluntary program.

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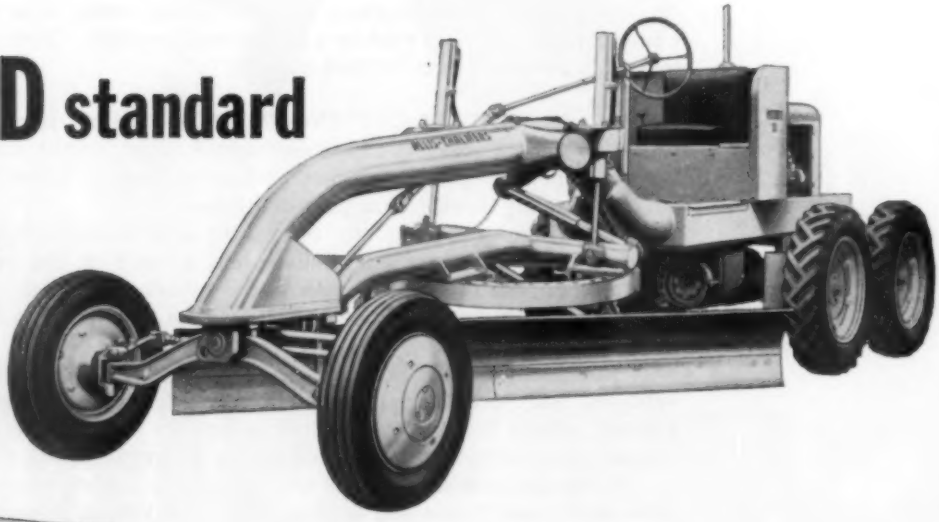
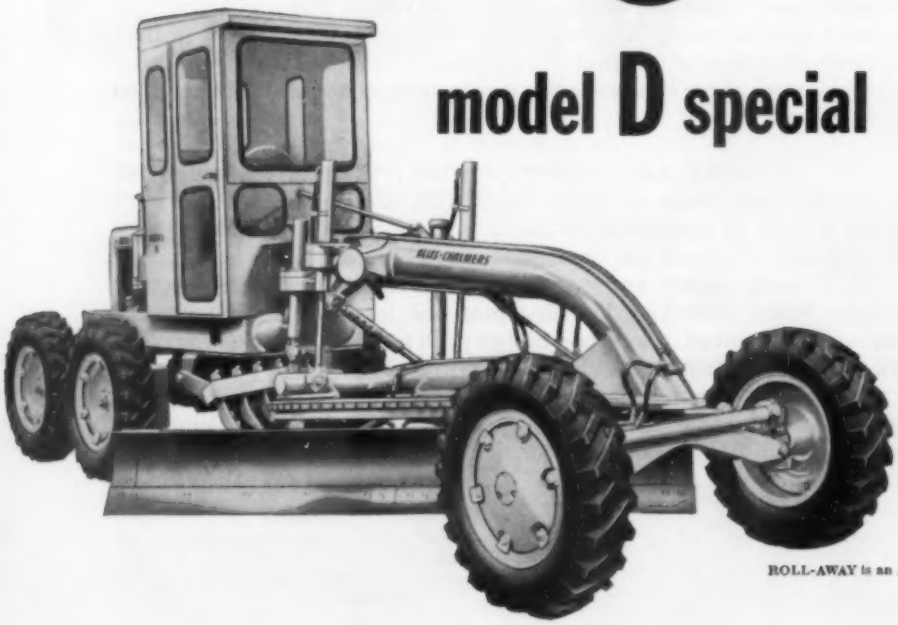
model D standard

50 hp
Approx. weight
8,800 lb (gasoline)
Approx. weight
9,350 lb (diesel)





model D special

50 hp
Approx. weight
10,900 lb (gasoline)
Approx. weight
11,450 lb (diesel)
4 forward speeds to 25 mph (approx.)
1 reverse speed to 3 mph (approx.)
All-steel cab*
Shiftable moldboard*
Hydraulic scarifier*
Leaning front wheels*
Power circle turn*

*Also available with the model D standard as optional equipment.

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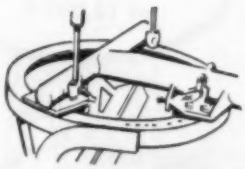
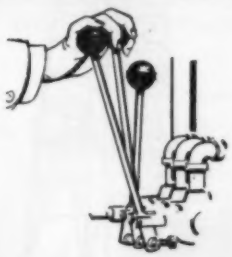
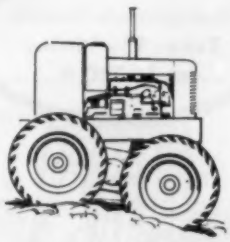
The ROLL-AWAY moldboard rolls dirt up and ahead to eliminate packing, reducing friction . . . gives you more performance per horsepower, more production per gallon of fuel.



Revolving circle and heavy tubular drawbar provide exceptionally stable moldboard mounting.

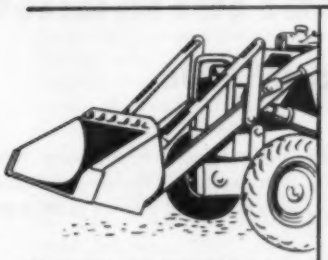


Convenient hydraulic controls, easy to operate. Two levers fit into one hand to control circle lift.

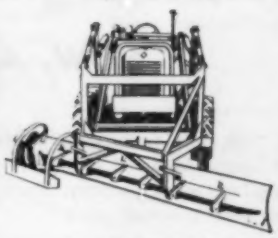


Positive tandem drive gives you four driving wheels under the heavy end of the grader.

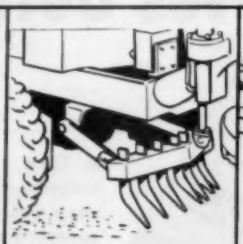
many job-multiplying attachments



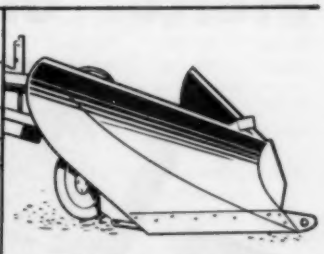
⅝-yd rear-mounted loader



Interchangeable shoulder maintainer



Midship-mounted scarifier



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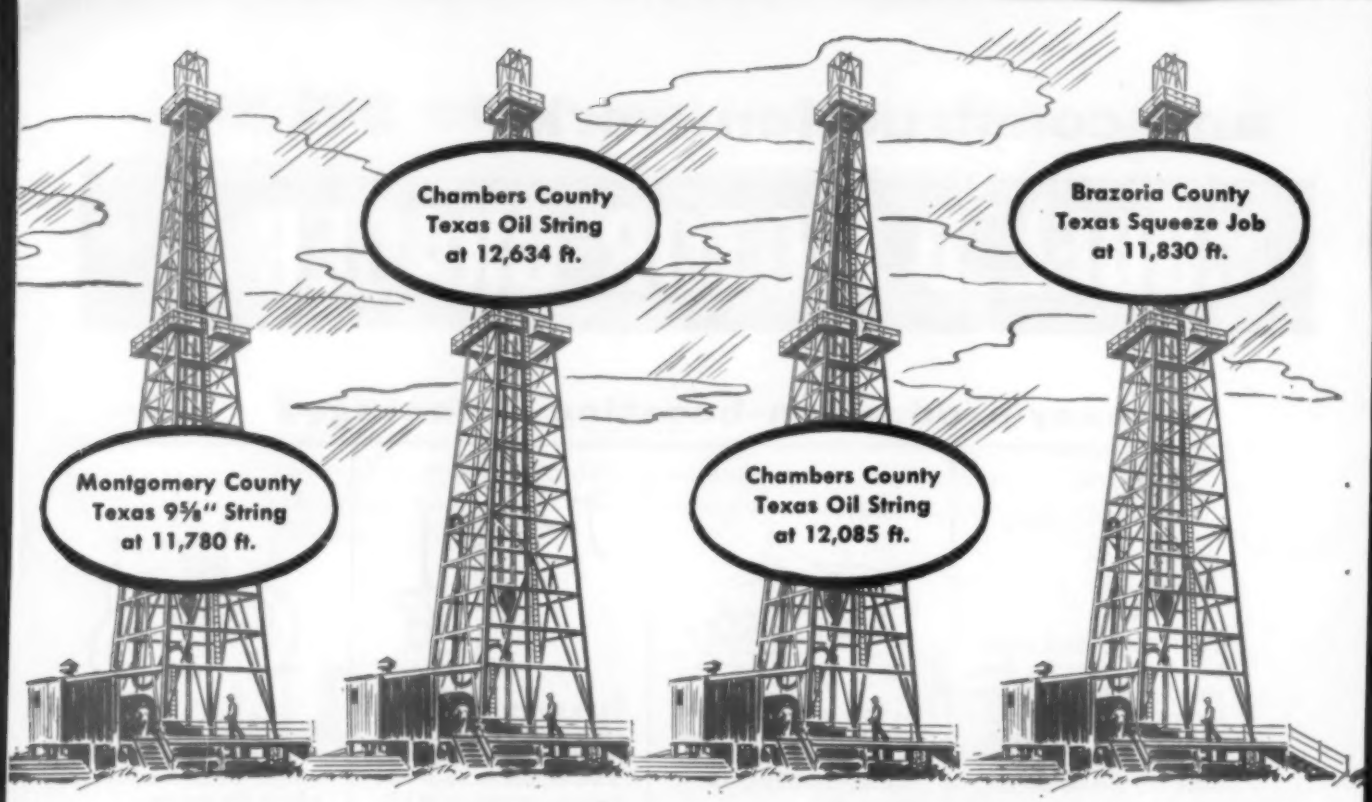

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Yield Shift Key to Gasoline Outlook

• Gasoline stocks are getting too high again as end of motoring season nears. To keep a firm market, refiners now must do two things: Step up heating-oil yields and run more crude into storage.

THE OIL INDUSTRY faces the prospect of a sloppy gasoline market this winter. Action taken by refiners in the next few weeks very well could set the pattern.

Here's the current situation:

... **Gasoline stocks,** despite cutback efforts, still are at a high level.

... **Demand** will start easing off soon with the end of the motoring season around Labor Day.

... **Distillate stocks** are low and therein lies a danger.

The winter buildup of distillates already has started on a minor scale. But if an unexpected heavy distillate demand should develop in the fourth quarter, it would force refiners to jump their crude runs to produce the heating oils. Byproduct of this production naturally will be gasoline, much of which at that season will have to go into storage.

That situation very well could result in a repetition of last winter's market which was characterized by too heavy gasoline inventories and weak prices.

A sudden switch . . . What happened to cause the ghost of gasoline overproduction to walk again?

Most refiners thought the situation was in hand a few weeks ago. They had kept refinery runs below last year's level throughout 1958. Gasoline stocks in May were pulled below last year's. Gasoline demand perked up and even went ahead of 1957. Products prices firmed and made advances.

A change occurred in late July, however. Gasoline production shot up because refiners persisted in getting a higher percentage of gasoline from a barrel of crude. This caused gasoline output to rise in spite of the restricted runs.

This points up one of the important facts about refining operations. Gasoline production can be controlled both by refinery runs and by product yields. Accompanying charts showing monthly production rates for the last few years reflect the influence of both factors.

Refinery production of gasoline this year ran below 1957 levels from January through June. Low point was April which is traditionally true because that month normally also is the low point for refinery runs. Production climbed sharply in May and June and in July shot ahead of 1957 production.

Despite this first-half reduction, the percentage of gasoline produced per barrel of crude run climbed. This percentage has been higher every month this year than for the corresponding month last year. It hit a high of 22.24 gal. per barrel of crude run in July.

While this means that refiners were making more gasoline from less crude, a word of explanation is needed before using this method of measuring gasoline-production trends. It is not strictly a percentage yield from crude because total gasoline output includes also the volume of natural-gasoline products blended at refineries.

But the yield is important. It explains why refiners and marketers could face trouble this winter.

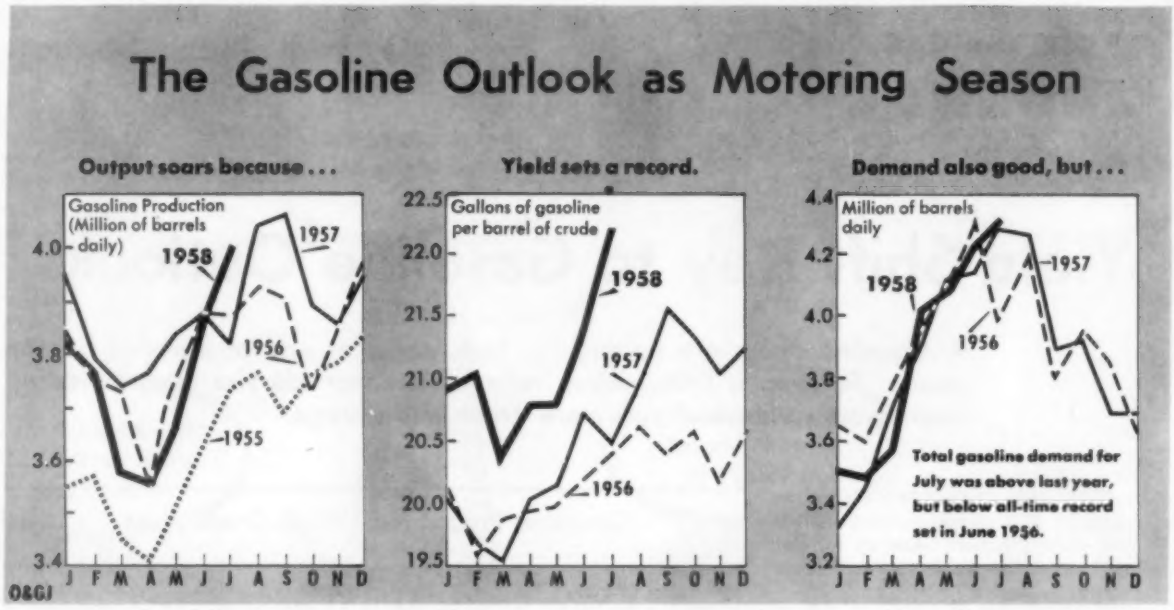
Refiners entered 1958 after hitting high production levels in the last half of 1957. If they had held 1958 gasoline yields to the 1956 or 1957 rates, less motor fuel would have been produced this year and gasoline stocks would not have built up so sharply in midyear.

Take July operations as an example. Refiners produced an estimated 4,005,000 bbl. daily of gasoline last month and ran 7,564,000 bbl. daily of crude. Thus, they produced 22.24 gal. of gasoline for each barrel of crude run.

If they had produced gasoline at the July 1957 rate of 20.50 gal. per barrel of crude run, gasoline output for this July would have averaged 3,692,000 bbl. daily or 313,000 bbl. daily less than actual production. The cut of 313,000 bbl. daily would have

Gasoline Production—% of Crude Runs

Refining District—	1958 May	1958 June	1958 July	July 1957	July 1956
East Coast	44.59	43.70	**50.28**	39.12	40.58
Appalachian:					
District 1	41.38	49.23	**44.92**	44.24	39.59
District 2	62.47	53.12	**57.31**	56.19	53.07
Indiana, Illinois, Kentucky	49.07	51.58	**52.43**	52.16	52.25
Minnesota, Wisconsin, Dakota	46.96	47.67	**46.70**	46.66	50.44
Oklahoma, Kansas, Missouri	55.46	55.59	**55.21**	55.65	53.92
Inland Texas	73.31	73.95	**73.23**	76.53	71.12
Texas Gulf Coast	51.06	51.30	**52.74**	48.77	48.40
Louisiana Gulf Coast	55.87	62.21	**62.33**	54.07	50.47
North Louisiana, Arkansas	38.42	38.39	**34.78**	35.87	36.92
Rocky Mountain:					
New Mexico	44.03	42.33	**49.27**	52.40	51.73
Other Rocky Mountain	46.32	45.77	**46.57**	46.99	46.86
West Coast	43.00	45.04	**48.37**	43.29	43.00
Total U. S.	49.75	50.99	**52.95**	48.81	48.38



amounted to 9,700,000 bbl. for the 31-day month.

This would have meant a tremendous change in the gasoline stock picture. Since stocks actually fell 6,000,000 bbl. in July, the 9,700,000 bbl. extra which could have been saved by a lower yield would have given a 15,700,000-bbl. stock reduction.

It takes no great imagination to figure what a reduction of this size would have done for the gasoline market now approaching the easing off period.

What about stocks? . . . Let's take a look at the gasoline-stock picture.

Gasoline stocks stand at 178,700,000 bbl. going into August. True, it's their lowerst point of the year—but still a bit too high, and higher than they were at the same time last year.

The excess stock position has not been entirely caused by a failure to reduce inventories this summer. Gasoline stocks actually have been too high for the past 2 years and were critically high at the end of the first quarter of this year.

At that time total finished and unfinished gasoline inventories amounted to 218,700,000 bbl., an all-time record. This accumulation represented gains of 12,000,000 bbl. over March 1957, and 19,000,000 bbl. over March 1956, and 34,700,000 bbl. over March 1955.

These high stocks plus prospects for only a limited increase in demand forced the reductions in refinery runs soon after the first of the year. Sharp cuts in runs brought corresponding decreases in gasoline stocks, particularly in April, May, and June. Stock reductions for these months were 12,400,000 bbl., 11,100,000 bbl., and 10,500,000 bbl.

It was a combination of these large reductions in the second quarter and comparison with the record reduction in July last year that made the July stock withdrawals of 6,000,000 bbl. seem small.

Conoco Chief Tells Refiners To Shift Yields, Hold Runs

REFINERS have a warning from L. F. McCollum, president of Continental Oil Co., against "ill-considered" increases in refinery runs as a result of the improved inventory picture.

McCollum says the vastly improved inventory story may very well give a false picture. It fails to reflect the unequal distribution of inventories in various parts of the country and the imbalance between crude and product stocks and between gasoline and distillate stocks.

"The current imbalance between gasoline and distillate inventories strongly suggests that a shift in refinery yield patterns would be highly desirable," he said.

"With refinery runs near present levels, a 1 percentage point increase in distillate yields and a similar decrease in gasoline yields would add about 7 million barrels to distillate inventories by November 1 and accomplish a corresponding reduction in gasoline production."

The second quarter gasoline-stock drop of 34,000,000 bbl. has been topped in the postwar period only by the reduction of 40,500,000 bbl. in the second quarter of 1952. And the 1952 drawdown was due to reduced production during a refinery strike and not to planned reductions.

The future . . . What's the outlook, then, for stocks the rest of the year?

Gasoline stocks will come down some in August unless refiners boost their runs or maintain high gasoline yields. Withdrawals, however, probably will not reach the 6,000,000 bbl. reported for July.

Stock changes in September have not been consistent in postwar years. Decreases have been reported for 7 years and increases for 5. Average for the 12-year period has been a small decrease of 202,000 bbl.

This means that normal conditions over the next 2 months would see gasoline stocks level off by the end of August and start up in October.

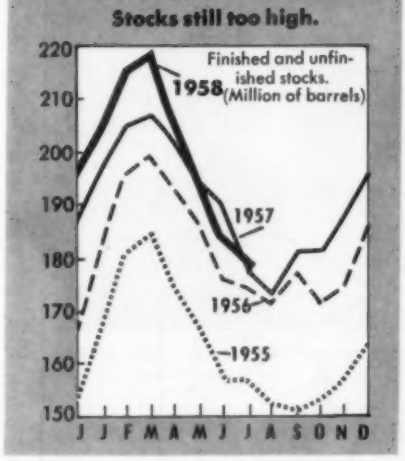
How're sales? . . . Demand for gasoline, fortunately, has picked up and shows signs of staying ahead of last year.

This is a sharp change from the first quarter of this year. Then total gasoline demand was very low due to a combination of weather, the low level of the over-all economy, and the return to normal exports.

The reduction in the first quarter amounted to 153,000 bbl. daily. It came from a 70,000-bbl. daily drop in exports and an 83,000-bbl. drop in domestic demand.

The tide turned in April this year when average demand for gasoline

Starts Decline



for the month topped last year by 1.7%. The first quarter had been 4.2% below the first quarter of 1957. The second quarter finally ended with a gain of about 1.5% over last year.

Average demand for June was higher than last year but lower than the total for June 1956. However, demand for that particular month boomed out of all proportion because of a big movement of gasoline to secondary storage.

The demand for July is estimated at 4,300,000 bbl. daily, which is in line with The Oil and Gas Journal's forecast of 4,248,000 bbl. daily for the third quarter. This forecast level of demand for the third quarter represents a gain of 2.4% over the corresponding quarter of last year.

Domestic demand actually is expected to gain 3% over the third quarter of last year. The average total demand will be lower, however, because gasoline exports are expected to be down about 22%.

What's needed . . . Economists are reading warning signs in the high gasoline-production levels, the high percentage yields of gasoline per barrel of crude, and the high stock position of gasoline.

They affirm the soundness of refining leaders who only 2 weeks ago cautioned their colleagues to watch runs and yields carefully or the market upturn would be spoiled (OGJ, July 28, p. 101).

They believe gasoline production should be curtailed immediately and refiners should now concentrate more of their efforts on production of distillates.

Product Curbs Sought

. . . by coal men and oil independents. Mounting import requests, plus new law, may point to mandatory controls.

NEW EFFORTS to secure import controls on refined products are in the making.

President Eisenhower's approval of the new foreign-trade bill will pave the way for a drive for across-the-board import limitations.

The Independent Petroleum Association of America and the National Coal Association are expected to spearhead the first test of the new national security clause.

And the mounting list of new requests for crude quotas, now topping 600,000 bbl. daily, lends color to speculation that the present voluntary program will give way to mandatory controls.

Products covered . . . Officials of both the IPAA and NCA see adequate ground in the revamped defense clause for control of product imports, which have been increasing at a rate greater—on a crude basis—than the decrease in imports of crude as such.

"The defense amendment specifically requires that programs to restrict imports of any product also cover imports of its 'derivatives,'" said Russell B. Brown, general counsel of the IPAA.

"Applied to oil, this would require limitation of product imports when it is necessary to restrict crude-oil imports."

Effectiveness of the new provisions will depend entirely on the administration, Brown conceded. But he has no doubts now that Congress had refined products in mind when it broadened the import section.

"The domestic industry will have a right, a duty, and an obligation to insist that both the letter and the intent of the new law be respected and implemented," he declared.

Action planned . . . NCA officials, with residual fuel their prime target, plan an early appeal to the Office of Defense and Civilian Mobilization.

The coal industry will lean heavily on the employment and other tests now written into the law to support their new plea for import controls.

So far, there is no indication that the Government itself will take the initiative in extending the import program to products.

Product imports have been under constant watch for some months. But Capt. M. V. Carson, Jr., program administrator, said last week there are no plans to put them under control "at the present time."

"We feel as far as residual fuel oil is concerned, demand pretty well regulates what is imported," Carson explained. "As for gasoline, the level of tariffs keeps it under control."

Carson's main concern at the moment is to draft some sort of standards to apply to companies that want to get into the importing field. Next month he will have to pass on more than 75 requests for quotas. And there is no assurance that more appeals will not be filed in the future.

System needed . . . The influx of would-be importers has revived suggestions in the industry for a new deal on quotas that would give every refiner a share in imports in line with his refining throughput.

Such a plan would solve the problem of new importers and ease the pressure to increase the import level to let them into the program, it is argued.

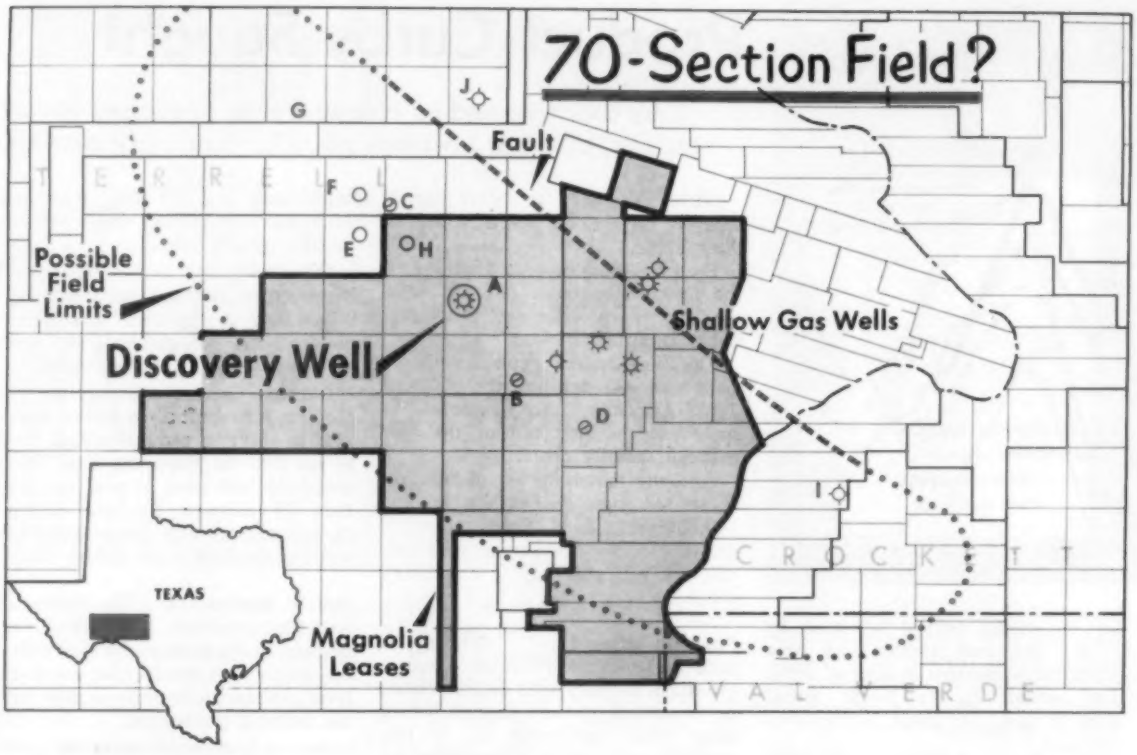
The idea, which has been laid before officials in Washington, is to put all import allocations together, figure out their percentage relation to domestic throughput and allow each refiner that percentage.

Inland refiners and others who might not want to refine their share of foreign oil could then make exchanges with importers who could use it.

There is also increasing pressure to make the controls mandatory. Carson so far has certified a half-dozen importers as not in compliance with the voluntary program. There is some fear that the number of violators might increase if present importers are continually asked to move over to make room for newcomers.

The only penalty now is loss of government contracts for products made from foreign oil not complying with the program. But importers thus penalized may still sell the government products made from domestic oil. Justice Department officials have said there is no bar to such sales, and a company is free to import all the oil it wants to and sell it to nongovernment buyers.

The cabinet fuels committee is now studying these and other angles of the situation.



New Giant Gas Field Is in the Making

IF GEOLOGISTS who know Terrell County's Brown-Bassett area best are any great shakes at making educated guesses, this one-well infant could balloon into West Texas' biggest and most-prolific gas field.

This, of course, excludes the Panhandle gas-producing area.

Geological experts with companies most closely associated with Brown-Bassett exploration sketch a glowing composite picture of what may come.

Drilling to date, they feel, already has proved up at least 10 sections of thick Ellenburger gas pay plus a substantial, also-prolific Fusselman gas zone.

More important, from what is now known from drilling and seismic data, they predict that drilling eventually may prove up a whopping producing area of around 70 sections or nearly 45,000 acres.

More thousands of acres could be added to this figure if the field's pay zones should be found productive on the downthrown side of a tremendous fault cutting from southeast to northwest across the field to the north of present production.

Action to date . . . The 1 Brown-Bassett (A on map), drilled by Magnolia Petroleum Co. for itself and Western Natural Gas Co., so far is the only well in the field officially completed.

Two others, Magnolia - Western Natural 2 Brown-Bassett and Richardson & Bass 1 Goode (B and C on map), are near completion. A fourth well, the Magnolia-Western Natural 2 Banner Estate, (at D) is drilling. Continental Oil Co. has staked one new location. And at least three more locations are about to be made.

The 1 Brown-Bassett, termed by the Journal last year as 1957's best West Texas discovery, now looks even better (OGJ, Aug. 5, 1957, p. 151).

The well potentialed 75,000,000 cu. ft. of sweet gas daily from the Fusselman between 12,383-12,448 ft. and 108,000,000 cu. ft. daily from a 1,300-ft. Ellenburger zone topped at 13,785 ft.

Operator completed only in the Fusselman due to mechanical trouble down the hole but is virtually certain to also open the Ellenburger to production later on. The discovery well is in Section 218, Block Y, TCRR Survey.

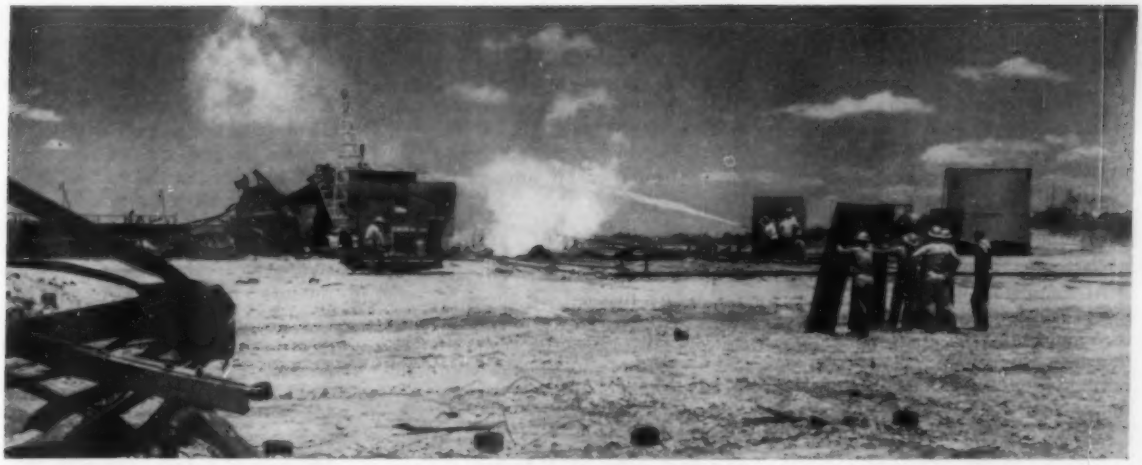
Two miles to the southeast, Magnolia last week was testing the 2 Brown-Bassett with total depth at 14,700 ft. in the Ellenburger. This well ran almost 300 ft. low to the No. 1, topping the Ellenburger at 14,052. It found water in the Fusselman.

The Ellenburger, however, looks good. Magnolia drilled about 300 ft. into that zone, set 5½-in. casing, then drilled another 400 ft. into the pay. It decided to stop and complete at that depth, with probably another 600 ft. of Ellenburger left undrilled, because of threatened blowouts and mud losses into the pay.

Seven tests at various depths and with various size chokes were run over the weekend of August 8-10. Average flow was estimated at about 30,000,000 cu. ft. daily natural. This, however, was with about 3,000 bbl. of mud and lost-circulation material in the pay, and operator expects the well to do much better when it cleans up. Acid may be used. Tests likely will be continued for some time.

Meanwhile to the northwest about 2½ miles from the 1 Brown-Bassett, Richardson & Bass has found gas in the Fusselman and was making hole in the Ellenburger after testing gas in that zone.

The 1 Goode was about level with the 1 Brown-Bassett at the top of the



SPECTACULAR BLOWOUT and fire which reduced this heavy rig to shambles cost Magnolia more than $200,000. But it may not have been such a bad investment after all in view of what it now appears the well discovered.

Fusselman but hit the Ellenburger about 340 ft. higher at 13,497 ft. The bit early last week had reached 14,524 ft. And operator intended to drill 100 ft. or so then stop and attempt to complete the well—leaving about 600 ft. of Ellenburger pay undrilled.

Richardson & Bass was unable to successfully drill-stem test the Fusselman. But the company likens the zone to that found in the 1 Brown-Bassett (actually there is a bit more Fusselman pay in the 1 Goode) and is certain that the formation will be similarly productive.

Drill-stem tests of the Ellenburger so far have developed only small gas flows (an early August test flowed at rate of 132,000 cu. ft. daily with no water). But operator feels that hole cleaning and mud acid likely will generate a big spurt in flow from this zone. The well's Ellenburger capability should be better known in about a week.

Meanwhile, other operators are preparing to join the play.

Continental Oil Co. has staked location (E) for an Ellenburger test about a mile southwest of the 1 Goode. Sinclair has made a tentative location (F) about ¾-mile west of the 1 Goode and about the same distance north of the Conoco location.

Shell is reported preparing to drill on a block it holds (G) about 3 to 5 miles northwest of the 1 Goode.

Magnolia's next location (H) is slated to be midway between the 1 Goode and the 1 Brown-Bassett—about 1½ miles from each. Its 2 Banner Estate is running about 300 ft. low to the 2 Bassett, 600 ft. to the 1 Bassett.

The pay . . . The Ellenburger pay in the two Magnolia-Western Natural wells is termed unusually good by Magnolia sources.

Magnolia experts say it is better than most found in the Midland basin to the north and about on a par with that producing gas at Puckett field about 50 miles northwest.

Porosity is thought to average about 2%. However, it ranges from zero to "very high" and is difficult to measure. The pay is fractured and vuggy.

Richardson and Bass has found the Ellenburger considerably tighter in the 1 Goode but full of vugs and cavities. The low drill-stem flow rates mean little, it thinks, in that the Ellenburger "generally behaves this way" until it is cleaned up. Also, R. & B. feels acid treatment should connect cavities to hike flow.

The structure . . . The Brown-Bassett structure, data to date shows, is a lot like the Puckett structure to the northwest.

It is a huge faulted anticline. It is a big structure even at the surface. But its size increases sharply with depth. Magnolia geologists estimate it has about 2,000 to 3,000 ft. of closure.

The big anticline, long known as the Pandale anticline, generally trends southeast to northwest. It extends southeast into Crockett and Val Verde counties. And Magnolia geologists think production also may be proved up that far southeast.

This isn't as wild a prediction as it might seem. Evidence is furnished by a well drilled into the Ellenburger miles away on the southeastern end of the structure in Crockett County in 1952-53.

This was Sun Oil Co.'s 1 Mitchell in Section 111, I&GN Block 1. It is a name to keep in mind, for future development likely will prove it to be the Ellenburger discovery for the entire huge Pandale structure.

The 1 Mitchell topped the Ellenburger at 13,750 ft. It drilled 1,208 ft. of the pay to 14,958 ft. before an impossible fishing job (lost drill collars) forced Sun to call a halt.

In subsequent tests, the well produced naturally 4,300,000 cu. ft. of Ellenburger gas daily on calculated absolute open-flow potential before it was shut in.

Most of the acreage at the northwest end of the big structure is now held by Shell Oil Co. Shell has been tight-mouthed on the subject. But reliable sources say Shell seismic work has shown the structure in this area to be just as high as at Richardson & Bass' 1 Goode—so far the highest well yet.

Heavy faulting indicated . . . All operators concerned predict that the big anticline will prove out to be complex geologically, with faulting the rule rather than the exception.

Geologists for Richardson & Bass think the 1 Goode, for instance, cut two faults in the Simpson zone between the Fusselman and the Ellenburger. This accounts for the well being flat on the Fusselman with the discovery while 340 ft. higher at the top of the Ellenburger. They believe the well is on the upthrown side of these faults.

These faults, which cut out roughly 340 ft. of section in the 1 Goode, are mere babies compared to a specimen running generally southeast to northwest to form the northeast side of the field on the accompanying map (heavy dotted line).

Exact direction of this fault can't yet be firmly fixed due to lack of

sufficient drilling—but it definitely is there.

Hunt Oil Co. can testify to it. Late last year Hunt drilled its 1 Cannon (J on map) only 2½ miles northeast of the present R. & B. 1 Goode. The Hunt well reached a total depth of 14,759 ft. and never reached the Devonian. Its log shows that this well hit formation tops consistently about 3,000 ft. lower than the 1 Brown-Bassett.

All companies in the area recognize the existence of this fault and all have it running generally in the same direction. Some plot it to trend a bit more northerly and closer to the Hunt well than shown on the map, some more westerly. Only further drilling can define it exactly.

Activity to step up . . . More drilling certainly is in the cards, and soon.

Magnolia and Western Natural have signed a provisional contract with El Paso Natural Gas Co. to take the gas providing sufficient reserves are developed to make laying a line to the field feasible.

This proviso now appears unneeded. The line to the field, if laid, will likely tie into El Paso's system in the Puckett area.

The negotiated price for the gas has not been disclosed. But Magnolia says the contract also calls on El Paso to build facilities to treat the gas.

Gas from the Fusselman is sweet and will require little treating. The Ellenburger product, however, will need lots of it. This gas tests out slightly more than 50% inert gases—mostly carbon dioxide with quite a bit of nitrogen and some sulfur.

Here, again, Brown-Bassett resembles Puckett. Ellenburger gas at Puckett tests out about 28% carbon dioxide.

The Magnolia-El Paso contract specified that the producer will be paid on the gas volume remaining after the inert gases are extracted. This means that a Brown-Bassett Ellenburger well, so far as the producer, is concerned, will produce only half as much gas—so the wells need to be big.

A new gas trend . . . The Brown-Bassett discovery coupled with previous knowledge suggests a northwest-southeast trend of Ellenburger gas fields in the area extending from Puckett on the northwest through Brown-Bassett and on to the southeast.

Evidence tending to confirm this is a well drilled by Magnolia in 1955-56 in northern Val Verde County about 20 miles southeast of the Brown-Bassett strike. The test, the 1 L. M. Morrison, went to a total depth of 15,143 ft. in the Wilberns sand. It topped the Ellenburger at 13,586 ft. and got its only show—gas—in this zone. Flow through 24/64-in. choke was 1,182,000 cu. ft. daily. The well, located in Section 10, Block Q4, TCRR Survey, is generally on a line drawn from Puckett through Brown-Bassett. It is shut in.

Puckett, Brown-Bassett's northernmost relative in Pecos County, was discovered in the early 1950's and still hasn't reached adulthood despite its large size. This prolific gas field now has 24 Ellenburger and 10 Devonian gassers with several more wells in the drilling and testing stages.

The productive area now stretches about 7 miles northwest-southeast and is 4 to 5 miles wide. At least 26 sections, or more than 10,000 acres, are proved. And there is substantial acreage in the semiproved column.

The field now is fairly well defined on the south and west but not on the north and east.

As at Brown-Bassett, Puckett's prolific Ellenburger formation is very thick—averaging around 1,700 ft. The Devonian reaches a maximum thickness of roughly 300 ft. on the flanks and thins to zero at the crest of the structure.

Oil was found in the Pennsylvanian zone in the northernmost portion of the field in 1956. And geologists think it quite possible that oil eventually also will be found on the Pandale structure.

How it happened . . . The huge Pandale structure has been known for many years. In fact, it produced its first gas way back in 1931.

Ohio Oil Co. completed its 1 Goode discovery at 5,606-12 ft. in the Pennsylvanian sand for 6,500,000 cu. ft. of gas daily that year to open Goode field. This old strike is only a couple of miles southeast of the Brown-Bassett Ellenburger discovery. The well was drilled deeper to 9,140 ft. in 1937, then abandoned.

Western Natural picked up its huge spread of acreage and reopened the field in 1949 with its 1 Hoge—drilling two more gas wells on the Banner ranch between the Hoge and Goode wells.

The structure lay dormant then until Sun first found gas in the Ellenburger in its Crockett County test. Interest in the area generally, however, was picking up due to the Puckett discovery and Magnolia's small Val Verde Ellenburger strike.

Finally in March 1956 Western Natural approached Magnolia offering a 50% interest in its great acreage spread (outlined on map) if Magnolia would test the structure at depth. Magnolia agreed conditionally. It would shoot the area first. If it liked what it saw, it would accept the offer and drill a well to 15,000 ft.

Good seismic records in the area were hard to come by due to a layer of hard limestone at the surface. Magnolia finally came up with a fair picture of the structure, however, by pattern shooting in draws where there was enough topsoil over the limestone to minimize that problem.

The picture confirmed what Magnolia needed to know: The structure went deep enough to justify a deep test. It accepted the Western offer and spudded in the 1 Brown-Bassett in May last year.

The rest is history. The well blew out in the Fusselman and caught fire last summer, destroying a $200,000 rig. The project survived six fishing jobs and was an expensive operation. But Magnolia, with good reason, thinks it was worth it.

Proved gas reserves in sister Puckett now are conservatively estimated at more than 2 trillion cubic feet.

The best-informed geologists now predict that Brown-Bassett, or whatever the field is officially named later, will attain a size perhaps four times as large as Puckett is now.

It's impossible to say how much gas such a giant would yield.

PROCESSING

Standard Oil Co. (Ind.) will enlarge its laboratories at Seymour, Ind., for the second time to expand its solid fuels program, started in 1954. Indiana Standard is developing for the U. S. Air Force a solid fuel for use in an auxiliary power unit (APU) for the air-to-air Falcon missile. The new Seymour facilities will be occupied this fall. They will include space for laboratories, a machine shop, and processing work.

El Paso Natural Gas Products Co. is now marketing a new superpremium gasoline in El Paso. The company unveiled its "Red Flame Super Premium" third brand at 17 "El Paso Dixie" stations last week. The octane rating was not specified, but the company said the gasoline is "the finest motor fuel available" and probably will sell for slightly more than other premium gasolines in the area.

American Chemical Corp., subsidiary of Richfield Oil Corp. and Stauffer Chemical Co. of New York, will build a plant to produce chlorinated

Shell Going to 24,000 Ft.

SHELL Oil Co. gave its entry in the deep-hole derby a new lease on life last week by extending its projected depth to 24,000 ft.—fully 2,000 ft. into the Springer formation of Oklahoma's Elk City field.

The 5 Rumberger, being drilled by Helmerich & Payne, Inc., continued to make some 30 to 40 ft. per day and was drilling below 22,206 ft.

"We are in the Springer formation geologically," a Shell spokesman said. "But we want to see a lot more of it."

For several weeks geologists had been uncertain whether the bit was in the Springer or Morrow, but now they believe they definitely have hit the Springer.

Shell's decision to go to 24,000 ft. means the 5 Rumberger, if drilling goes according to schedule, will pass Phillips Petroleum Co. 1-A Montgomery in Pecos County, Texas, but will not match Phillips' world titleholder, the 1 EE University, also in Pecos County.

Phillips' wells . . . The 1 EE University, now at 24,357 ft. and projected to 25,000 ft., will be shut down several weeks while awaiting new drill pipe.

Because of the great depth, Phillips has ordered a high-tensile strength drill pipe for the top 10,500 ft. of the string. The pipe (Spang-Chalfant) is 3½-in., 15.50-lb., 43-40 grade steel. The pipe formerly in use also was 3½-in. but was 13.30-lb. weight.

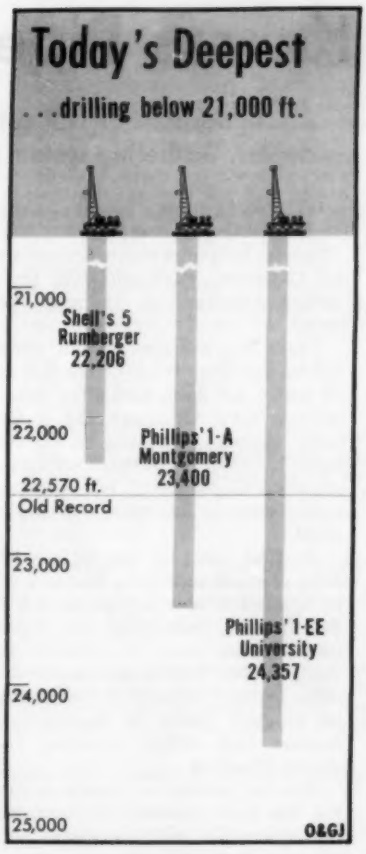
The special pipe will have a greater safety factor in tension. Delivery is expected after September 1 and resumption of drilling around September 10.

The 1 EE University, drilled by Phillips' own crew, expects to hit the Ellenburger formation objective shortly and then drill into it several hundred feet.

The 1-A Montgomery has been drilled to total depth of 23,400 ft. into the Ellenburger but was having trouble last week setting packer. This well is being drilled by Great Western Drilling Co.

Packer failures while attempting to run tubing have delayed testing on the well, the world's second deepest. The packer will be set at 22,970 ft. The well has 400 ft. of open hole.

The 1 EE University is located 8 miles east of Fort Stockton, and the 1-A Montgomery is 30 miles southwest of the 1 EE University.



BRIEFS . . .

hydrocarbons. C. F. Braun & Co., Los Angeles engineering and construction firm, is making preliminary design studies for the plant, which probably will be located in southern California.

Hancock Oil Co.'s refinery fire last May at Long Beach, Calif., did not cause as much damage as early estimates indicated. The $8-million loss figure is too high. The refinery's 11,000-bbl. cat cracker was only 30% damaged, and the new 3,000-bbl. cat reformer escaped serious damage. However, a substantial part of the tank farm was destroyed.

Ralph M. Parsons Co., Los Angeles, is studying how the plant can best be rebuilt. C. F. Braun & Co. is determining which vessels and other equipment can be reused.

The Texas Co. will start construction in November on a feed-preparation unit, a Hydrotreater, and a catalytic reformer at its Lawrenceville, Ill., refinery. Bechtel Corp. will do the construction and engineering and complete the job late in 1959. The feed-preparation unit will have a 26,000-bbl. capacity and the other units 12,000 bbl. each. The cat reformer will double the refinery's reformate capacity.

Universal Oil Products Co. stock may go on sale to public this fall. All obstacles have been cleared with the exception of Guaranty Trust Co.'s remuneration. Ebasco Services is evaluating the company's worth and is expected to conclude the job in September.

Foster Wheeler, Ltd., has been awarded contract for a new asphalt plant which Imperial Oil, Ltd., will add to its 7,650-bbl. refinery at Edmonton, Alta. The new unit, with capacity of 1,500 bbl. daily, will go on stream next February.

Houdry Process Corp. has introduced a new Houdriforming catalyst known as Type 3-G to produce high-octane reformates. The new type can be used in existing reformers and is fully regenerable.

Also for Refiners . . .

IN THE NEWS: Gasoline stocks are getting too high—shift in yields and crude runs to storage now may forestall sloppy gasoline market this winter (p. 103) . . . New drive for curbs on product imports is planned by independent oil men and coal men (p. 105) . . . We've gone far enough on octanes with present methods, research team tells SAE West Coast meeting (p. 112) . . . Negotiations continue in Aurora Gasoline strike (p. 113) . . . India may switch plans and build one large refinery instead of two small ones in Assam (p. 125).

PLUS THESE TECHNICAL REPORTS: Canada's refining capacity soars (p. 197) . . . Process Costimating (p. 221) . . . Cutting gasoline vapor loss in cone-roof tankage (p. 222).

Kansas Pipeline Starting

. . . in September will cut trucking charges to crude producers. Gathering system is planned for new 242-mile line.

WHEN Jayhawk Pipeline Corp. starts operating next month, crude-oil producers in southwestern Kansas and the Oklahoma Panhandle will get a netback increase of 75 cents per barrel.

That's the average amount which will be cut from trucking charges for oil which has been hauled to distant markets since Shamrock Oil & Gas Corp. stopped purchasing in the area April 1, 1957. Truck hauls sometimes exceeded $1 per barrel, but producers were fortunate to have any market at all.

At first, most of the 10,000 bbl. daily of crude moved by Jayhawk will be trucked to the originating station. But the line will bring the distress output much nearer to markets and will stimulate further development as well. Jayhawk already is taking steps to connect pools in southwestern Kansas, and further gathering lines can be expected

But the problem at present is finding the most economical transportation system for widely scattered pools whose output is small.

New markets opened . . . The 242-mile 10 and 12-in. Jayhawk Pipeline will deliver oil primarily to refineries of Derby Refining Co. at Valley Center (Wichita) and National Cooperative Refinery Association at McPherson, Kans.

Jayhawk is owned jointly by Colorado Oil & Gas Corp., parent of Derby Refining, which has a 16,000-bbl. plant, and NCRA, which has a 28,000-bbl. plant.

Starting at Meade station, 12 miles southwest of the town of Meade, Kans., the line extends east for 56 miles to Harper Ranch, Clark County, where some production will be picked up. From there it goes northeast to Chase, the second pump station, and then east to McPherson and south to Valley Center.

A 6-in. connection has been made to Service Pipe Line at Hudson, an 8-in. connection to Arapahoe Pipe Line Co. at Schurr, and a 6-in. to Continental Pipe Line Co. at Lyons, Kans. Producers thus will have good opportunities for expanding markets in the future.

Completion near . . . The line was being filled last week in preparation for the start of operations.

The Arkansas River had subsided to the point that R. H. Fulton & Co., the contractor, could install the crossing at Sterling.

The line will have initial capacity of 18,000 to 19,000 bbl. daily with 290 hp. at Meade and 400 hp. at Chase station in electric-motor-driven centrifugal pump units. Throughput may start at 9,000 to 12,000 bbl. daily.

A gathering system has been completed in Leslie-Stephens pool, near Meade, to handle 750 bbl. daily.

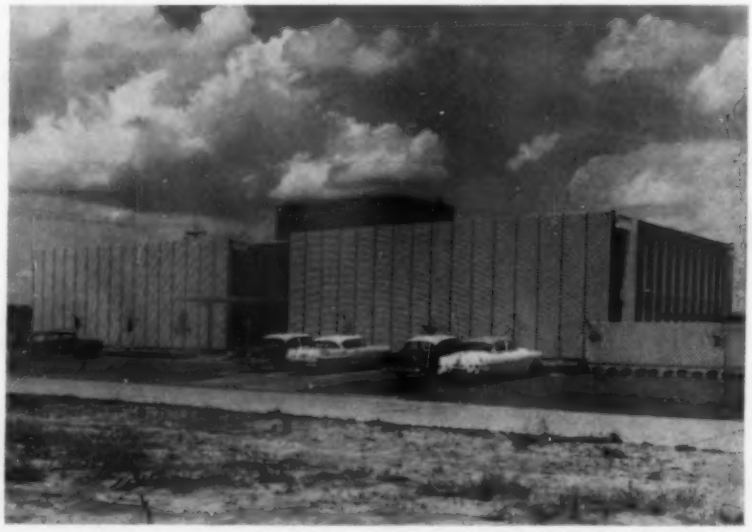
Jayhawk is buying right-of-way for 140 miles of 6-in. feeder lines. A 90-mile line will be laid to Interstate field near the Kansas-Oklahoma-Colorado line. A 50-mile line will connect Pleasant Prairie field in Haskell County.

These extensions will raise the project cost above $10 million.

Interim crude markets . . . Shamrock stopped purchasing Oklahoma and Kansas crude because of increased Texas Panhandle output served by its pipeline.

Shamrock, the producers, and crude buyers and transporters cast about for temporary outlets pending completion of Jayhawk. Some 2,000 bbl. daily in the Oklahoma Panhandle was trucked to the Kings Mill station of Phillips Pipe Line Co. for shipment from the Texas Panhandle to Cushing and connections with other lines.

Another 2,000 bbl. daily from southwestern Kansas was hauled to the Schurr station of Arapahoe. Panhandle Eastern Pipe Line Co. purchased its own Interstate production, and 2,000 bbl. daily more from that pool was hauled to Phillips Pipe Line for an Illinois buyer. Around 1,800 bbl. daily was trucked from the Novinger and Singley pools to the Hutchinson station of Service Pipe Line Co. for delivery to Derby.



New Home for Pipe Line Technologists

A NEW and unusual building was recently completed in Houston as the home of Pipe Line Technologists, Inc.

The $350,000 ultramodern building, which houses 100 of the company's 150 employes, might be called a "glass house," since three walls of the two-story structure are entirely glass. The east and west walls are shaded by a free-standing solar screen 4 ft. from the glass walls. The screen is built of 12-in. lengths of octagonal-shaped clay conduit with circular center, cemented together lengthwise and supported by steel beams. It makes practical the use of glass walls for increased light and beauty, and helps increase efficiency of air conditioning.

The company was founded by Herbert E. Fisher in 1951 as an engineering firm specializing in evaluating, planning, and supervising construction and operation of pipelines. One subsidiary, Pipe Line Technologists, C.A., operates in Latin America, with headquarters in Maracaibo. Another subsidiary, Pipe Line Technologists (Alberta), Ltd., headquarters in Calgary.

New Kenai Wildcat

to be sunk by California Standard near discovery.

STANDARD Oil Co. of California has decided to sink a new Kenai Peninsula test 1½ miles southeast of its Alaskan Swanson River Unit discovery.

Standard has abandoned a 14,221-ft. wildcat on the peninsula's Deep Creek Unit, 75 miles southeast of the discovery. The Deep Creek test is Alaska's deepest to date (OGJ, July 28, p. 109).

Standard is operator for itself and Richfield Oil Corp. on some 834,000 acres held jointly by the two on Kenai. The Swanson River Unit covers 71,600 acres and the Deep Creek Unit 62,017 acres.

Thus far, only the Swanson River Unit has proved productive. The unit's second test well, now idle, was drilled to 12,046 ft. about 2 miles south of the discovery well.

Humble's well . . . Meanwhile, another Alaskan test has drilled below 10,870 ft. toward a 12,000-ft. objective.

Humble Oil & Refining Co., in a joint venture with Shell Oil Co., is drilling the 1 Bear Creek about 5 miles north of Island Bay in the Kanatak area of the Alaskan Peninsula.

Drilling was delayed for several weeks by an unsuccessful fishing job before the well was plugged back to 10,500 ft. and sidetracked. The remote test was spudded last September.

NLRB Rules Against Quaker

THE NATIONAL Labor Relations Board last week ordered Quaker State Oil Refining Corp. to come to terms with the Oil, Chemical and Atomic Workers International Union.

The board's order disposed of a complaint filed by the union in May 1956 against an alleged lockout at Quaker State's Emlenton, Pa., plant and company efforts to block union activities of its workers.

The board held that a shutdown of part of the company's operations during negotiations for a new contract was an effort to force the union to accept proposals by a given date and thus a violation of the National Labor Relations Act. The company had argued its action was due to reasonable fear of a "quickie" strike.

The decision requires Quaker State to pay 135 workers for the period after they were laid off in February 1956 until they were reinstated the following May.

The JOURNAL Said . . .

50 years ago

August 20, 1908

R. T. Daniel, who made two or three million dollars out of real estate in Spokane, Wash., and Miami, Fla., has purchased the northeast corner of Third and Main Streets in Tulsa and has plans ready for a handsome structure to be erected thereon. Mr. Daniel thinks the oil and natural gas found so abundantly here are going to make this part of Oklahoma a very rich country, and he may make his home in Tulsa.

The Markham Daily News, in a thrilling account of the recent blowout at Markham, gives a list of the stuff that went into the hole, and among other things mentions "eight Jack inch engines." Shades of John M. Arters! Would anyone know the Ajax by that name?

25 years ago

August 17, 1933

Much pressure is being brought to bear on President Roosevelt in favor of price regulations for the oil industry. Stacks of telegrams have been received by the President, who has talked the code over with Gen. Hugh S. Johnson, administrator.

The Oil and Gas Journal has complied with President Roosevelt's agreement by conforming with the substituted provisions of the code of fair practices for the periodical-publishing industry. The certificate of compliance has been signed and the Blue Eagle will be displayed in subsequent issues.

Oklahoma City produced the greatest quantity of crude oil in a 7-day period it has ever done since the field opened. Its daily average output for the week ending Saturday, August 12, was 324,770 bbl. In the week previous it was 227,810 bbl. The large increase was due to the fact that many of the operators wanted to get as much of their August allowable production as possible out of their wells and onto the market.

10 years ago

August 19, 1948

The oil shortage is over. There is plenty of gasoline for the remainder of the touring season and there will be ample supplies of heating oil in all parts of the country next winter.

Construction of the trans-Arabia pipeline is proceeding at a reduced rate pending a decision by government officials in Washington on further exports of steel pipe for the project.

The average motor octane ratings of premium price motor fuels sold at filling stations throughout the country is 79.4, compared with 78.5 for the winter of 1946-47.

Red Cartoonist Pulls a Goof

THE VAUNTED Soviet propaganda machine slipped a cog last week.

The latest cartooning effort of Moscow aimed at belittling the western world and intensifying its problems in the volatile Middle East indicates that a little more research is in order for the propagandists.

In a Middle East cartoon, captioned the "Source of Provocation," Moscow depicts a Middle East oil derrick which strangely enough isn't "gushing black gold." This time it has hatched a flock of U. S. jet planes.

The cartoonist slipped just a bit when he labeled the derrick "Standard Vacuum Oil." Standard Vacuum, a hybrid company jointly owned by Jersey Standard and Socony Mobil, operates in many areas of the Eastern Hemisphere—but not in a single Middle East oil country.

Stanvac, faced with declining oil production in Indonesia and, so far, no fantastic exploratory results in other areas of the Far East, greeted the news that it is now in the Middle East with enthusiasm that was diminished only by the source of the report.

"We're happy to know about all this," Stanvac commented dryly.

Krokodil, Moscow

"Source of the provocation."

Are we heading for . . .

A Breather in Octanes?

WITH OUR PRESENT methods, we've gone far enough on octanes—probably too far.

This strong view was aired last week by a four-man team from California Research Corp. at the SAE West Coast meeting in Los Angeles.

Adding Research octanes above the 99 level costs close to a penny per gallon per number. This cost, they said is not returned in the added efficiency of higher compression ratios in today's engines.

On this premise, they called on the oil and automotive industries to hold the line where it is until new developments make it possible for the customer to get more for his money.

Situation temporary . . . Something has to give before this upward climb should continue. Something probably will, they concede. This is expected to be a temporary situation.

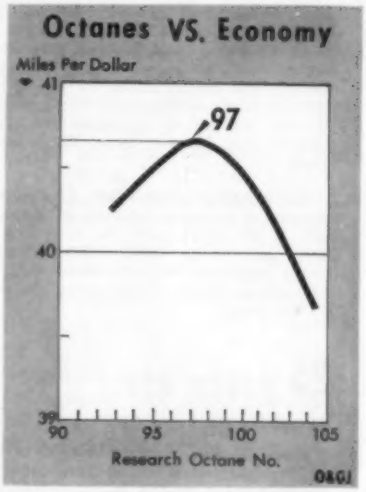
Some new process may turn up for making higher octanes, or a less costly route by present techniques may evolve. On the other hand, engine designers should be able to boost the efficiency bonus for each incremental rise in compression ratio.

Agreement on the last point was voiced by two General Motors Corp. authors. They repeated their conviction that still higher compression ratios will make the conventional spark-ignited engine more efficient. (OGJ June 16, p. 62). In their study of compression ratios from 9:1 to 25:1 they found that, although the gains are approaching diminishing returns, a substantial improvement in thermal efficiency of modern engines is still possible through further increases in compression ratio. Thermal efficiency of their test engines peaked at 17:1.

But the GM findings did not attempt to measure the cost of this greater efficiency. Whether going to 17:1 or to any level short of it will net the motorist any more miles per dollar was left contingent on "the ability of the petroleum industry to continue to increase economically antiknock quality of commercial gasoline."

Study in octanes . . . In stating their case, the Cal Research team admitted that the multitude of variables, from crude type to engine tolerances, made hard and fast conclusions impossible.

As a base for their study, they set



up a hypothetical, typical refinery of 100,000-bbl. crude capacity.

It comprised crude distillation, two-stage catalytic reforming, fluid catalytic cracking, thermal cracking of residuum and cycle oil, butylene alkylation and propylene-butylene polymerization. These units were theoretically operated at average conditions (Table).

They then "spent" $22,000,000 raising the premium grade gasoline octane, in four steps from the basic 99.3 to 104.3 Research octane. The over-all per gallon cost of 3.9 cents they held to be conservative because the hypothetical refinery represented minimum cost, maximum utilization and ideal product quality.

These increments in cost were then assigned to a basic price for the gasoline. From road tests of eight cars of three different makes, they determined the returns in miles per dollar for each octane level, matching compression ratios to octanes and measuring engine efficiency in terms of mileage.

Their findings: For the conditions used, the optimum return in miles per dollar is at about 97 Research octane number. The motorist will not benefit in terms of lower fuel cost if fuels above this octane level are supplied, even though his engine is exactly matched to maximum use of the higher octane rating.

It is implicit, they contend, "that maximum economy would be obtained in the idealized situation where all cars on the road were at the same compression ratio and all required gasolines of 97 octane."

"The octane number of today's premium gasolines" they concluded, "is at or somewhat beyond the most economical point for present-day, commercial purposes. Octane numbers of premium gasolines should stay at or near present levels until new developments make it possible for the customer to get more for his money."

No engine breakthroughs . . . No such breakthrough looks likely in the near future, according to Peter Kyropoulos of GM. But he told the SAE of engine improvements on the way. Here's what he sees for the spark ignition, diesel, turbine, and free piston engines.

Marked changes could result from use of a turbocharged aluminum engine. In comparison with the conventional 10:1 CR cast iron spark-ignition engine this new type would:

. . . **Produce** 285 hp. vs. 200.

. . . **Weigh** 1.55 lb. per horsepower vs. 2.81.

. . . **Consume** .27 lb of fuel per horsepower hour vs. .401.

. . . **Measure** 4.21 cu. ft. per 100 hp. vs. 5.86.

For the diesel engine, he expects

Minimum Cost of Premium Octane Improvement

Average 100,000 BPCD U. S. Refinery, 70% Regular, 30% Premium

Process addition—	Premium F_1	Sensitivity (F_1—F_2)	Cumulative cost over base cent gal.	Pool gasoline produced BPCD
1. Base refinery	99.3	10.8	. . .	46,800
2. Increassd reforming severity plus reformate splitting	100.8	11.9	0.47	45,860
3. Additional butane alkylation	101.3	9.1	0.88	47,430
4. New high severity reformer	103.8	8.1	3.31	44,840
5. Isopentane recovery and n-pentane isomerization	104.3	6.4	3.89	44,780

Total added investment over base refinery—$22,000,000.

appreciable decreases in size, weight and fuel consumption by the 1970's. Do not expect major breakthroughs in improved thermal efficiency, but rather a relative steady progress in economy.

The gas turbine promises to be an engine for very large earth-moving equipment, logging and mining operations, and mountain highway hauling.

A possible contender in the automotive field is the free piston engine since it does not suffer by comparison with the piston engine in throttle response, fuel economy, or cost. It has a superior torque curve and allows for split passenger car installation with important vehicle advanages. But it suffers a serious weight disadvantage.

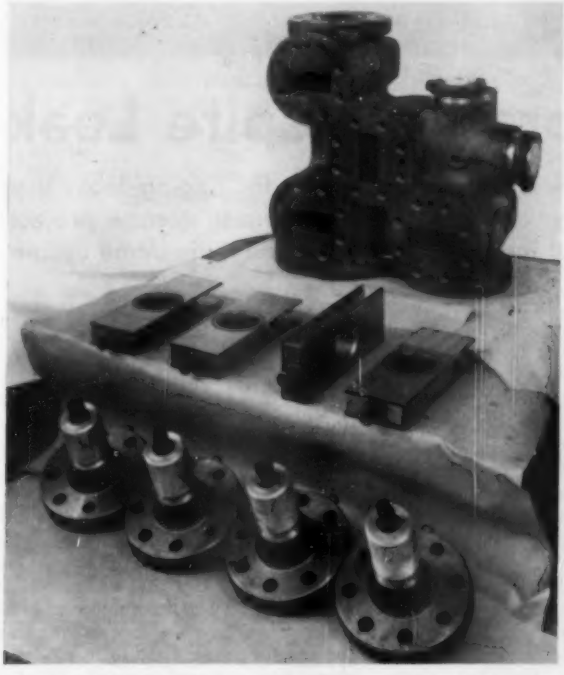
Aurora Talks Go On, Suit Filed

NEGOTIATIONS are continuing between OCAW and Aurora Gasoline Co. despite counter moves by four deposed local union leaders of the 3-months' wildcat strike at the Trenton, Mich., plant.

The four leaders expelled by OCAW President O. A. Knight asked Wayne County Circuit Judge Victor Torganski for an injunction restraining union local administrator, Clyde S. Shamblen, from further negotiations.

The judge refused the writ but ordered Shamblen to show cause why he should not halt negotiations. Strangely, Torganski earlier had ordered the four leaders—Floyd Rue, George Vitale, William Kelledes, and B. F. Henson—from interfering with Shamblen's administration (OGJ, Aug. 11, p. 68).

OCAW reports all contract issues have been resolved with Aurora except wages and Aurora's refusal to rehire 21 members fired as a result of the strike. Union claims Aurora has offered to reinstate some and arbitrate discharge of a number of others. The union is insisting on return of all to work.



THESE components form four valves and body of . . .

Cameron's small, simplified, composite wellhead.

New Tree to Be Used by Shell in Maracaibo

COMPOSITE christmas trees, the new look in wellheads, soon will be appearing on Lake Maracaibo.

Composite trees are so-called because they lump several usually separate items into a single block.

In a single casting, there are these items: Master valve, flow tee, swabbing valve, wing valve, choke box, flow-line valve, and gin-pole socket.

Cia. Shell de Venezuela ordered six of the trees to combat the problem caused by boats and barges colliding with wellheads in the lake. Cameron Iron Works of Houston produced the trees.

Easier to guard . . . The composite trees take up only about 20% of the space needed for conventional trees. This makes it possible to cover the wellhead with a small, sturdy slip-over steel jacket.

Moreover, the flow line can hug the casing from the choke box all the way down to the lake bottom to protect it from collisions.

Of course, the tree has unitized features similar to those on models already introduced in the United States (OGJ, April 7, p. 104, and June 2, p. 96). Elimination of flanged connections does away with a source of leaks, and the small size of the tree simplifies storage, shipping, installation, and repair.

The new trees are rated for 3,000-psi. working pressure. While these models are made from a casting, Cameron expects that extremely high-pressure models can be made from steel forgings.

Herscher Dome: Storage Despite Leak

• For 5 years engineers have been devising methods for finding leaks that have plagued what might have been the world's biggest storage project. The problem isn't yet solved, but ingenuity has made the huge dome usable.

DEVELOPMENT of underground storage on the mammoth Herscher dome in Illinois reads like a detective story.

It's a story which started 5 years ago when Herscher looked like the solution to all the peak-load problems of affiliates of Natural Gas Storage Co. of Illinois.

Then came the awful realization that gas was escaping from the acquifer reservoir into which it was injected. Thus began what must be the most baffling, the most maddening search for a leak in industry history. It's still going on.

The tale is a tribute to the ingenuity, the persistence, and the patience of engineers whose job was to find the leak. The stakes were high: Storage capacity worth as much as a new hundred-million-dollar pipeline from the Southwest to Chicago, and the ability to expand service to one of the largest markets in the country.

Victory is elusive . . . After years of trying every known test, and some new ones, the source of the leak has been pinned down to a small area.

And while Natural Gas Storage can't claim total success, it can at least claim a standoff in the battle to convert the giant Herscher acquifer structure into usable storage.

The leak has been neutralized by construction of a special gas-gathering and treating system. At first it was believed that the Galesville sand could hold 93 billion cubic feet of natural gas. In practice it has held 31 billion, about half of which is usable.

Now company hopes are high again. The reason is that pilot tests, now under way, indicate that the deeper Mount Simon formation may hold as much as 70 billion cubic feet, of which half would be usable.

Most unusual, too . . . Besides the distinction it has acquired because of its persistent leak, Herscher claims title to the most unusual storage project.

All gas is being stored in formations which have never produced oil or gas.

The storage zone is a porous, water-bearing sandstone. The brine is displaced as gas is forced into the rock. Because of the leak, Natural Gas Storage is now producing water from this zone so that storage capacity can be increased without greatly increasing injection pressure.

How it started . . . The Herscher story started early in the postwar period when spiraling demand for gas for house heating in the Chicago-northern Illinois area intensified the area's historic peak-load problem (demand rockets up in winter to four times the summer figure).

Big storage somewhere near Chicago became a must if Natural Gas Pipeline Co. of America and Texas Illinois Natural Gas Pipeline Co.—bringing gas from the Panhandle-Hugoton area and the Gulf Coast, respectively—were to meet the peak demand. Both Natural Gas Pipeline and Texas Illinois, like Natural Gas Storage, are subsidiaries of Peoples Gas Light & Coke Co. of Chicago.

Along with this, the number of one-family dwellings on the waiting list for gas for house heating in Chicago alone has averaged around 370,000 since 1950.

Since there are no large depleted oil or gas fields near Chicago, Natural Gas Storage had to go an unconventional route. The possibilities of gas liquefaction and of mining large caverns in limestone formations were explored.

Finally the company hit on Herscher.

This structure has been known for many years. The state's first "Trenton" production was discovered by shallow wells on the structure just after the turn of the century. Roughly 18 oil wells were drilled to 200 ft. But the oil deposit was small and all wells were abandoned after short periods of pumping.

No attempts were made to plug

these early wells after abandonment. Casing was merely cut off below the surface and farming continued.

Subsequent drilling showed the entire Herscher structure to be about 11 miles long, 7 wide, and to take in about 8,000 acres. It is a north-south, doubly plunging anticline with a closure of 200 ft.

The proximity of this structure to company pipelines and market plus the estimated gas-storage capacity of the Galesville sand acquifer led to a detailed study.

In the early 1950's Natural Gas Storage drilled 104 test holes to the top of the Galena formation, an easily recognized marker from 150-350 ft., at section-line intersections. The top of the Galena was mapped and the structure plotted.

The company then drilled and cored four wells through the Galesville, the intended storage reservoir, to check on Galesville porosity and permeability and the adequacy of the caprock overlying the reservoir. Findings were favorable.

The company followed up by completing 21 injection-withdrawal wells in the Galesville on the crest of the structure. Another group of 13 wells was drilled to the top of the storage zone at downdip locations on the flanks to observe water levels and follow movement and effect of the gas bubble to be created.

Actual injection began April 1, 1953, through the five highest wells on the structure. Gas for injection came through a 30-in. line laid to connect with the Texas Illinois system near Dwight, Ill.

The main plant, including a 10,000-hp. compressor station and dehydration plant, was put in service July 1, 1953. Capacity was 300,000,000 cu. ft. daily (capacity of dehydration plant since hiked to 430,000,000 cu. ft.).

Injection at that date was hiked to 200,000,000 cu. ft. daily.

The leak . . . Trouble cropped up late that same month after injection had been under way for 4 months.

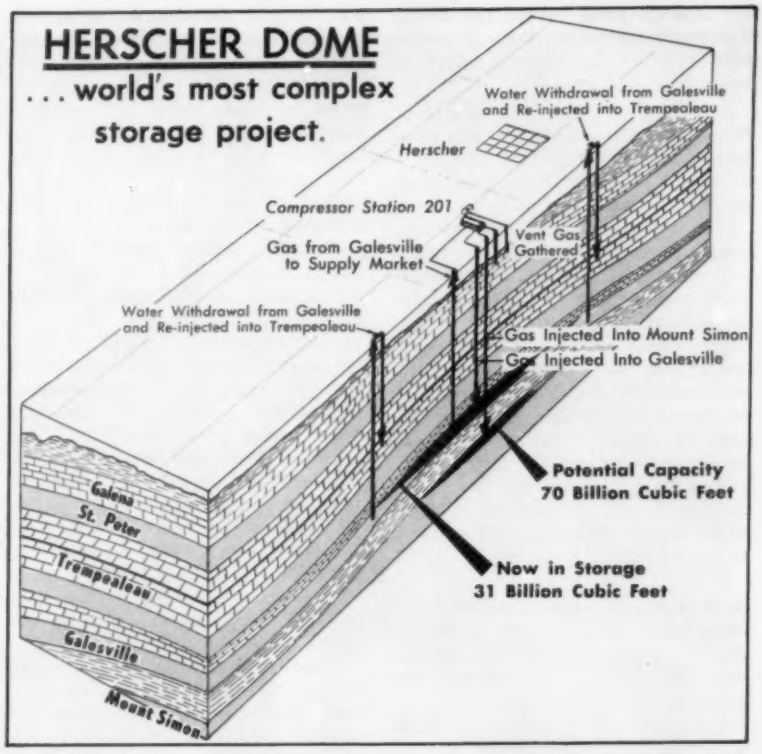
A shallow water well in the town of Herscher began to bubble gas. The following week 32 more village wells, most of them about 100 ft. deep, were spewing gas. The only Herscher oil well open to the surface started producing gas at the same time.

The volume of the escaping gas from this well increased steadily to an estimated 1,500,000 cu. ft. daily within a week. Then it started flowing water with sufficient pressure to support a water column 80 ft. high.

Gas injection came to a screeching halt a week after the leakage was detected. The old Galena oil wells were located, cleaned out to their original bottom, and allowed to vent.

It was apparent that the Galena formation had in some way been pressured with injected gas. Engineers figured that if enough vent wells could be drilled, leaking gas in the town could be cut way down and perhaps stopped.

A Galena well was drilled and cased adjacent to each injection well and allowed to vent. Leakage in the town, as predicted, began to taper off.


HERSCHER DOME
. . . world's most complex storage project.
Water Withdrawal from Galesville and Re-injected into Trempealeau
Herscher
Compressor Station 201
Vent Gas Gathered
Gas from Galesville to Supply Market
Water Withdrawal from Galesville and Re-injected into Trempealeau
Gas Injected Into Mount Simon
Gas Injected Into Galesville
Potential Capacity 70 Billion Cubic Feet
Now in Storage 31 Billion Cubic Feet
Galena
St. Peter
Trempealeau
Galesville
Mount Simon

Big search begins . . . Several theories were advanced as possible explanations as to how gas from the 1,750-ft. zone could be appearing at 150 ft. These put the blame on:

. . . Faulty well cementing, permitting gas to channel up the hole behind the casing.

. . . Lack of adequate caprock. The hard dolomite overlying the storage reservoir could be more porous in some areas.

. . . Faulting. Upwarping of formations to form the structure might have caused undetected faults or fracturing.

. . . Old wells. Roughly 20 old holes have been found. But possibly one or more deeper ones had escaped notice.

Natural Gas Storage pitched in immediately to check these theories and to find where the gas was leaking and stop it.

Since then the process has run all known methods of leak detection and invented and run several new ones. Here is a blow-by-blow account:

Test 1: In August the company ran gamma ray and neutron logs in each Herscher well to locate any small gas-charged zones behind the casing. Result: Nothing of any consequence was found.

Test 2: Five wells were drilled and completed to each of the formations between the Galesville and the Galena. Result: No evidence of gas was found in any of the intermediate zones between these two formations.

Test 3: Twenty-one shallow structure tests to the Galena were drilled in areas of steep dip to check the possibility of faulting. Result: Dip in one area was relatively steep, but there was no evidence of any displacement or discontinuity of section.

Test 4: Sensitive thermistors were used to survey each well from total depth to surface. These would detect cooling which would result from any casing leaks. Result: None.

Test 5: Down-hole microphones were run to pick up any leak noise. Results: None.

Test 6: A spinner survey was run to check possible flow variations in the wells after they had been shut in. This might indicate points of leakage. Results: None.

Test 7: Injection-withdrawal wells were killed with water to shut off

any leakage from behind the casing that might originate from the shoe area. Results: No apparent effect on volume of vent gas.

New tests introduced . . . When these known tests failed to find the reason or source of the leak or leaks, Natural Gas Storage tried some new ones.

Test 8: Radioactive tracers were used for the first time to try to locate gas movement. Argon 41 cylinders were irradiated at the Argonne Laboratories, rushed to Herscher by car, and lowered into the wells opposite the casing shoe. A gamma ray instrument was employed to pick up movement of any radioactive gas behind the casing: Result: No evidence of gas leaks behind the casing.

Test 9: A thermal tracer device was developed and run in all injection wells. Result: No anomalies revealed in any of them.

Neutralizing the leak . . . Completing these tests took more than 4 months. And it became apparent that finding the leak or leaks at Herscher was going to be a long, arduous job.

In that 4-month period, the company was able to determine that the vent wells drilled to the Galena were effectively preventing a pressure buildup in that zone. In January 1955 10 Galena wells were connected to a pilot gathering system. The gas was recycled to the Galesville with a three-stage, 660-hp. compressor.

The system handled roughly 2,500,000 cu. ft. daily for 3 months without major difficulty. Natural Gas Storage then expanded the system to tie in all Galena vent wells to the main station and modified equipment to recycle all leakage gas. Flow rates on this system have fluctuated between 6,000,000 and 14,000,000 cu. ft. daily since.

Later in 1956 gas began to build up in the St. Peter formation. Four St. Peter wells were drilled and tied into the recycling system to prevent a serious pressure buildup in that zone. Recycled volumes from that zone have run between 1,500,000 and 4,500,000 cu. ft. daily.

More searching . . . While work on the vent gas-gathering system was proceeding, the company continued to pursue the mysterious leak.

Test 10: Magnetometer surveys were run covering most of the top portion of the structure to find any metal which might indicate the presence of more undetected old wells. Result: Only one more well found. It was not the source of the leak.

Test 11: A geochemical survey was run over the structure to outline, if possible, the extent of the old Galena oil accumulation and to see if the extent of gas in the Galesville could be fixed. About 130 soil samples were taken from as many stations at a 12-ft. depth. Result: No anomalies found.

Test 12: Another tracer test was launched in the summer of 1957.

Propylene was injected into the gas stream through the northernmost injection well in the field, butylene through the southernmost in concentrations of about 50 p.p.m. Results: butylene appeared at the surface in a vent well adjacent to the southern well within 2 weeks. The butylene tracer cloud grew through the rest of 1957. Propylene showed up late in November in the St. Peter zone 1,300 ft. north of the point of injection into the Galesville.

Natural Gas Storage concluded at the end of 1957 that it had a major leak in the south end of the field. Evidence also pointed to a minor one in the north end.

Thus the search for the frustrating leakage has finally made some progress. The company now knows the general vicinity of the leaks. It still doesn't know for certain, however, what is causing them and how to stop them.

Living with it . . . Meanwhile, the company decided in 1956—since finding and stopping the leakage obviously would yet take a minimum of many months—to find how to operate the reservoir safely at a maximum rate.

It settled on drilling more wells into the Galesville on the flanks of the structure to remove water from around the gas bubble. This would permit injecting more gas with a minimum pressure increase.

A well was drilled on the west flank and a pilot test started. The pilot well produced about 825 g.p.m. The water was reinjected into the Trempealeau zone. This is a vugular, cavernous section about 300 ft. thick and about 350 ft. above the Galesville.

Reservoir pressure in the Galesville was maintained stable for 30 days prior to withdrawing any water and for 30 days after the test well went in service.

The increase in gas volumes injected indicated that roughly 50% of the water drained from the Galesville was being replaced by gas. The favorable results of the pilot led to an expansion of the water-withdrawal program in the summer of 1957.

Four Galesville water wells were drilled and put in service with average capacity of about 500 g.p.m. each. Four Trempealeau wells were drilled adjacent to each Galesville water well to get rid of the water.

The results of this program looks good. But Natural Gas Storage feels it is still too early to pin down yet just how much benefit will come from it.

Developing Herscher as a gas-storage project has been a long, rocky road—and an expensive one.

The expenses incurred there, however, are relatively minor if viewed from the standpoint of what the big project means to Chicago area consumers or of what it would cost to build new long-distance lines to do the same job.

Barges Coring Off California

CALIFORNIA oil companies are continuing their exploratory efforts for offshore oil deposits. Most activity is concentrated in the Santa Barbara channel area.

It was in this area last month that the state granted leases on four 3,840-acre parcels.

California's floating drill barges are a primary tool in the search. To date 11 barges or self-propelled core boats have been outfitted by California companies. As many as 10 have been at work at one time off the California coast.

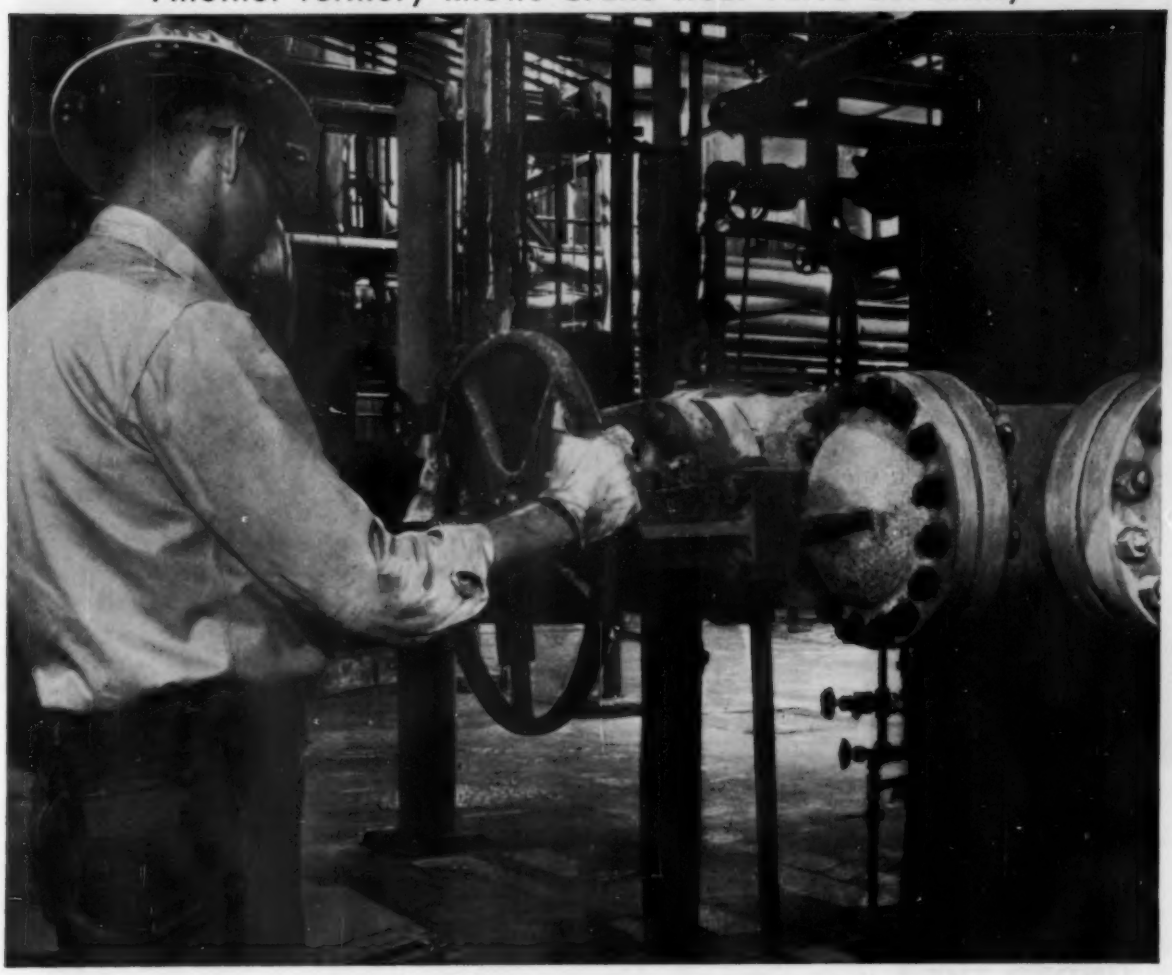
The 260 by 48-ft. beam CUSS I, owned by the four-company group of Continental - Union - Shell-Superior, is being watched closely. Equipped with a 98-ft. derrick, the CUSS I barge can perform like a land-based rig because it uses 4½-in. and larger drill pipe. The other core boats work with drill tubing in the 3-in. range and use masts of the core-drill rig class.

A recent survey of California's core boats revealed that nine of them had drilled 446 core holes in the past 3 years to an average depth of 2,930 ft. (OGJ, July 21, p. 50). Figures on CUSS I were not included.

CUSS I has drilled in excess of 100,000 ft. of hole, including some up to 6,300 ft. deep. In a recent program it drilled eight core holes to an average depth of 3,530 ft. Holes were bottomed in the average time of 6.6 days.

Earlier it drilled eight other holes to an average depth of 5,000 ft., requiring an average of 8.7 days to reach total depth.

Another refinery knows Crane steel valve durability



How to insure steady control of hot oil for seventeen years plus

There's no guesswork in this refinery's hot-oil valving. Quality comes first and foremost in its valve buying.

The block valve shown being operated on Continental Oil Co.'s thermal cracking unit at Lake Charles, La., was installed in 1941. Working at 830 deg. F., this Crane 8-inch, 300-pound steel gate has never been out of the line for repair.

Except for routine lubrication and repacking when needed on turn-arounds, maintenance through the past 17 years has been of a very minor nature. Still this Crane valve is leak-free, completely dependable, operates with ease.

On steel valves—on all valves and fittings for refinery needs—Crane is the name that assures real, long-term values and protects against unreal price-tag savings.

A fact to remember in today's squeeze on your company's profit.

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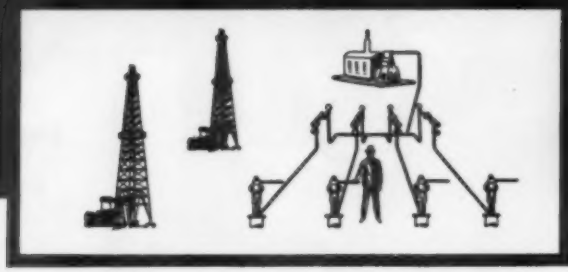

UNDER THE TOUGHEST FIELD CONDITIONS

For 38 years Sargent has successfully worked in research, development and manufacture of oilwell, aircraft, marine, missile, and electronic equipment. The vast knowledge and experience gained through successfully engineering and manufacturing products in these highly advanced fields has been incorporated into building the finest pumps in the oilfields. Sargent builds every API classified pump obtainable with metals to fit any and all well conditions.

In 1924 the first Sargent hydraulic pump patent was obtained (patent #1,503,602).

Through years of research, re-design and refinement, Sargent now manufactures the pump proven to be the most efficient rodless, long stroking, bottom hole hydraulic unit obtainable, which actuates the time-proven bottom hole pump. Sargent provides the most complete service in the industry by company trained experts through company operated field stores.

The outstanding features of the Sargent rodless, long stroking, free or conventional design hydraulic pump are: • More volume • Wide selection of proven metals and design • Higher efficiency in gassy wells • Simple, yet rugged construction • Service in the fields (at the point of operation).

That's why you can "Watch Sargent" pump performance anywhere in the world under the toughest field conditions and learn for yourself that results prove "Sargent Builds 'em Better"!

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– U.S. Supreme Court

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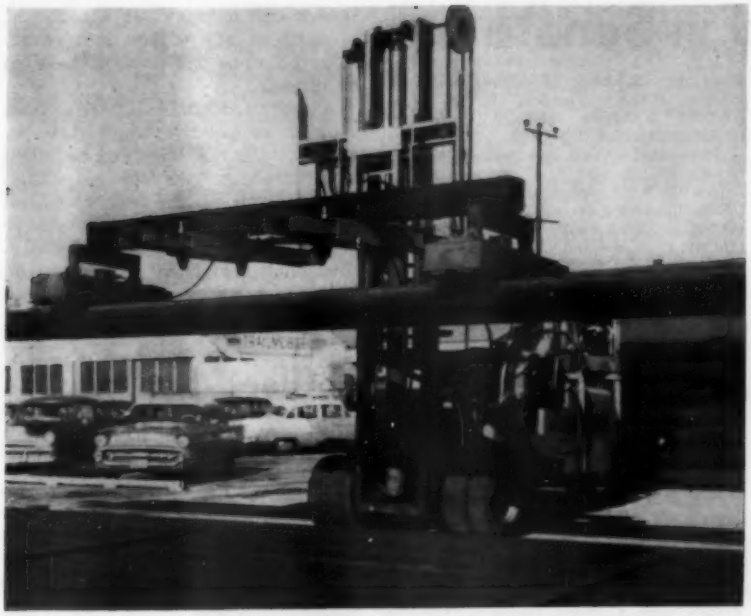


PIPE CLINGS to specially equipped fork-lift truck as . . .

Magnets Help Lift Heavy Pipe

A FORK-LIFT truck equipped with electromagnets offers a very convenient tool for handling pipe, a California gas company has found.

The method is being used by Southern California Gas Co. in its Los Angeles pipe yards. Small-diameter pipe, 2-in. and larger, is handled eight or ten joints at a time. Large-diameter pipe, up to 30 in. and 60 ft. long, is handled in singles.

The electromagnets also handle coated and wrapped 30-in. pipe, although the lifting power of the magnets is reduced.

The special magnets, built by F. W. Shrader Co., Los Angeles, are 60 in. long, 21 in. wide, and 12 in. high. Through use of aluminum conductors, a high load-carrying capacity is possible with a relatively light magnet.

How it works . . . A converted gasoline-engine driven welding machine rated at 300 amp., supplies the required 3,000-watt direct current for each 1,900-lb. magnet.

A five-position master switch allows the driver to control the amount of lift applied. Low power is used to pick up the pipe. After the load has been raised a couple of inches, full power is applied. When the pipe is set down at the desired location, the switch is moved to a reverse position to assure rapid demagnetizing.

The pole shoes for the magnets are readily removable and interchangeable. By designing the shoes to the loads to be handled, the magnets can be used to handle either pipe, plate, or structural steel. Several lengths of large-diameter pipe can be handled by using clusters of magnets.

INDUSTRY BRIEFS . . .

McCulloch Oil Exploration Co. of California, Inc., planned to spud in its third Washington wildcat last week on a site about 20 miles east of Tacoma. The rig is on the Krainich lease on the Kummer anticline. The well is projected to 5,000 ft. Last year, McCulloch drilled and abandoned two wildcats about 1 mile to the north of this new effort. The earlier wildcats went to 6,023 ft. and 4,326 ft. Both reported some shows.

A Los Angeles superior-court judge last week ruled a lease between the city and the Los Angeles Harbor Development Corp. is invalid. The lease covered 10 sq. miles of tidelands in the harbor area beyond the breakwater. In a taxpayer's suit, a Los Angeles attorney charged the City Council failed to exercise "judgement and care" in awarding the lease to the Harbor Development Corp.

Schlumberger Well Surveying Corp. has added a seismic reference service to its well-logging and auxiliary operations. The service provides velocity data for both well evaluation and geophysical exploration in the vicinity of the well.

The new service combines the Schlumberger sonic log with seismic check shots between various levels in the bore hole and the surface. It also provides necessary permits for seismic shooting, surface survey, shot-hole drilling, velocity recordings, geophone recordings, and computation. Century Geophysical Corp. works with Schlumberger as subcontractor and supplies seismic equipment.

Northwestern Oklahoma's significant North Buffalo field, a Harper County Arbuckle lime discovery of earlier this summer, gained its second well and a new-pay discovery.

The second well in the field, Sinclair Oil & Gas Co. 1 Kuhn, flowed 40 bbl. of oil per hour on drill-stem test of the basal Kansas City-Pennsylvanian lime at 5,211-55 ft. The discovery also flowed oil on drill-stem test of the Lansing-Pennsylvanian at 4,560-4,605 ft. Location of the 1 Kuhn is ½ mile northeast of the 1 Holcomb, a discovery that ranks as the most important of the year in the Anadarko basin. It opened the fourth producing Arbuckle area in the entire basin (OGJ, June 30, p. 125).

Shipping interests and government officials will meet this week to talk about nuclear-powered tankers and merchant ships as replacements for obsolete vessels. Maritime experts estimate that nuclear equipment, now more costly than conventional engines, may be competitive in cost in less than a decade.

The design of a nuclear-powered tanker will be the subject of a report presented for discussion. Some experts believe that big oil carriers offer one of the most promising areas for this type of motive power.

Welex, Inc., Fort Worth, and Borg-Warner Corp., through its Byron Jackson division, have filed a patent infringement suit in federal District Court in Houston against GO Oil Well Services, Inc., Fort Worth. The Welex-BJ suit alleges that well-perforating operations of GO infringe on a Welex patent which is licensed exclusively to Byron Jackson.

Depletion Saved in Senate

NEW EFFORTS to cut the industry's 27½% depletion allowance were rebuffed by Congress last week.

But the first roll-call votes on the issue since 1951 showed that the industry's defenders have lost much ground.

A proposal of Sen. John J. Williams (R-Del.) to cut the rate to 15% was turned down by a better than 2-to-1 vote. But a similar idea was rejected 7 years ago by nearly 8 to 1.

The 63-to-28 vote against Williams contrasted sharply with the 71-to-9 tally in 1951.

The Senate also rejected a plan of Sen. William Proxmire (D-Wis.) to put oil and gas depletion on a graduated scale. The margin was slightly slimmer, 58 to 31.

The formal action came after lengthy debate on the floor. All but 7 of the 96 senators voted. It was announced that three of the absentees would have, if present, voted for a rate cut and one would have voted against it.

During the argument, supporters of a cut in the allowance made much of Treasury estimates that reduction to 15% would increase government revenues by $420 million a year. That would still leave the industry a $575 million take from depletion.

A somewhat smaller revenue, around $310 million a year, would have been gained under Proxmire's plan to leave the 27½% allowance intact for producers with gross income of less than $1 million a year while cutting it to 21% for producers with income between $1 million and $5 million and to 15% for those with greater income.

How senators voted . . . The vote on the Williams amendment found 11 Republicans and 15 Democrats supporting the 15% rate:

Aiken (R-Vt.), Bricker (R-Ohio), Case (R-N.J.), Church (D-Idaho), Clark (D-Pa.), Ervin (D-N.C.), Gore (D-Tenn.), Green (D-R.I.), Humphrey (D-Minn.), Jackson (D-Wash.), Javits (R-N.Y.), Langer (R-N.D.), Lausche (D-Ohio), Magnuson (D-Wash.), McNamara (D-Mich.), Morse (D-Ore), Neuberger (D-Ore.), Pastore (D-R.I.), Potter (R-Mich.), Proxmire (D-Wis.), Purtell (R-Conn.), Smith (R-Maine), Symington (D-Mo.), Thye (R-Minn.), Wiley (R-Wis.), and Williams (R-Del.).

Voting against it were 33 Republican and 30 Democratic senators:

Allott (R-Colo.), Anderson (D-N.M.), Barrett (R-Wyo.), Beall (R-Md.), Bennett (R-Utah), Bible (D-Nev.), Bridges (R-N.H.), Bush (R-Conn.), Butler (R-Md.), Byrd (D-Va.), Capehart (R-Ind.), Carlson (R-Kans.), Carroll (D-Colo.), Case (R-S.D.), Cooper (D-Ky.), Cotton (D-N.H.), Curtis (R-Neb.), Dirksen (R-Ill.), Douglas (D-Ill.), Dworshak (R-Idaho), Eastland (D-Miss.), Ellender (D-La.), Flanders (R-Vt.), Frear (D-Del.), Fulbright (D-Ark.), Goldwater (R-Ariz.), Hayden (D-Ariz.), Hickenlooper (R-Iowa), Hill (D-La.), Hoblitzell (R-W. Va.), Hruska (R-Neb.).

Ives (R-N.Y.), Jenner (R-Ind.), Johnson (D-Tex.), Johnston (D-S.C.), Jordan (D-N.C.), Kennedy (D-Mass.), Kerr (D-Okla.), Knowland (R-Calif.), Kuchel (R-Calif.), Long (D-La.), Malone (R-Nev.), Martin (R-Iowa), Martin (R-Pa.), McClellan (D-Ark.), Monroney (D-Okla.), Morton (R-Ky.), Mundt (R-S.D.), Revercomb (R-W. Va.), Robertson (D-Va.), Saltonstall (R-Mass.), Schoeppel (R-Kans.), Smathers (D-Fla.), Smith (R-N.J.), Sparkman (D-Ala.), Stennis (D-Miss.), Talmadge (D-Ga.), Thurmond (D-S.C.), Watkins (R-Utah), Yarborough (D-Tex.), Young (R-N.D.), Mansfield (D-Mont.), and O'Mahoney (D-Wyo.).

If present, Sens. Kefauver (D-Tenn.), Hennings (D-Mo.), and Payne (R-Maine) would have voted for the lower rate, and Holland (D-Fla.) would have voted against it.

On the vote on the Proxmire proposal, Sens. Carroll, Douglas, Jordan, Kennedy, Mansfield and O'Mahoney switched to its support, and Bricker switched to the opposition.

Oil, Gas Tax Urged

for Colorado. Constitution change could pave the way.

GOV. STEVE McNICHOLS is being asked to approve a maximum 5% severance tax on oil and gas production in Colorado.

That's the recommendation of the governor's advisory committee on natural resources.

The committee also advised McNichols to encourage the legislature to put to a vote of the people a constitutional amendment establishing validity of the present gross income tax on oil and gas production.

This levy, graduated from 2 to 5% depending upon the dollar value of oil and gas production by individual companies, contributes about $4 million annually to the state treasury.

A strongly-worded resolution accompanying the subcommittee's report to McNichols urged that Colorado adopt tax policies designed to encourage, rather than discourage, mineral development in the state.

Present tax . . . The California Co., largest producer in the huge Rangely oil field, is now challenging the constitutionality of the present gross income tax on oil and gas.

The firm is appealing an adverse decision in Denver District Court last February 15. Calco seeks to invalidate the present tax as discriminatory against one industry. If it succeeds, as much as $20 million in revenues collected since 1953 might have to be refunded.

A true severance tax has been avoided in Colorado until now because of the fear the revenue might have to go into the old-age pension fund instead of the state's general fund. Recently, however, the old-age pension setup was changed by constitutional amendment, and Colorado could impose a severance tax without jeopardizing the state's general fund.

Loffland Expands

with new office in Europe. Price goes to The Hague.

LOFFLAND BROTHERS Co., Tulsa, the industry's largest drilling contractor, is expanding its operations into the Eastern Hemisphere by opening an office at The Hague.

W. J. Price

W. Jess Price, who formerly was Loffland Brothers' foreign contact representative, has moved to The Hague to head the office. At present, the company, which has 102 rigs, has only one rig operating outside the Western Hemisphere.

PIPELINE

Southern Natural Gas Co. has received temporary authority to build $29 million in new pipeline facilities in Louisiana, Alabama, Georgia, and Mississippi. The FPC authorized construction of 224 miles of 24-in. mainline loops; 46 miles of 20-in. loops; 40 miles of 14-in. loops; 53 miles of branch-line loops of various diameters; four 16-in. river crossings; and 9 miles of field lines. Southern proposes over a 2½-year period to build some 800 miles of trunk and gathering lines costing $64½ million and increasing system capacity by 380,000 M.c.f. daily.

Great Lakes Pipe Line Co. will reduce the loading and billing service charge on products delivered from its 15 terminals from 5 to 2 cents a barrel, effective on shipments accepted September 10. A reduction also will be made in charges to many of the shipper-owned terminals constructed in recent years at points served by Great Lakes or connecting pipelines.

It is drilling for Esso Standard in Libya.

Loffland President R. W. Wire said the company expects to seek business in the Middle East and North Africa.

Price, who has wide experience in foreign drilling work, recently returned to the Loffland organization after running his own contract drilling business in Lubbock, Tex., for a year.

New Ohio Terminal Opened

THE LITTLE BIG INCH last week delivered its first shipment, 50,000 bbl. of premium gasoline, into a new $2-million terminal built by Texas Eastern Transmission Corp. at Lebanon, Ohio.

This is the easternmost terminal on the 20-in. system, built during wartime to carry products from the Texas Gulf Coast to New Jersey. It was converted to natural gas in 1947, and this year returned to products service. The first shipment was received by Socony Mobil Oil Co., Inc.

Participating in dedication ceremonies marking the event were Millard Neptune, senior vice president, and J. W. Hargrove, financial vice president of Texas Eastern; Walter Guthrie, division manager Socony Mobil; F. B. Neptune, executive vice president and general manager Phillips Pipe Line Co.; and Capt. M. V. Carson, administrator of the voluntary oil import program.

Trunkline Buys Offshore Gas

TRUNKLINE Gas Co. has contracted to buy gas from two offshore fields and one South Louisiana field to bolster its expansion plans now pending before the Federal Power Commission.

Initial price of the gas has been set at a near-record 22 cents per M.c.f.

The purchase, pending FPC approval, involves gas in West Cameron Block 67 and Vermilion Block 26, both off the coast of Louisiana, and the inland North Fresh Water Bayou field. Union Oil Co. of California is the sole producer involved, in Block 67 and the onshore field. Block 26 is held jointly by Union and Pan American Petroleum Corp.

Gas reserves in the three fields are estimated unofficially at more than 1 trillion cubic feet.

Trunkline is counting on the reserves to help supply its proposed new markets in Michigan. The company filed plans with the FPC last month for an $81.5 million expansion of its pipeline system (OGJ, July 14, p. 82).

The expansion would permit Trunkline to increase its gas deliveries by 135,000,000 cu. ft. daily during the 1959-60 heating season. Later, Trunkline hopes to increase Michigan deliveries to 200,000,000 cu. ft. per day.

Under the purchase contracts, the pipeline company would be required to pay 75% of the gathering taxes.

A milestone . . . Approval of the sale by the FPC would signal the beginning of a long-delayed development program in the two offshore fields.

It also would give Union a chance to recover at least part of its losses sustained in one of the most spectacular blowouts on records.

The discovery well in Block 26 blew out in June 1956 when it hit a high-pressure sand at 11,435 ft. Gas flowing from the well was ignited and burned more than 5 months.

The wild well was killed through a directional hole drilled from a second platform which was hastily erected nearby. The original platform and drilling rig toppled into the sea as a result of the blowout.

After making contact with the first hole, the relief well was shut in. A vertical well later was drilled to about 13,550 ft. from the same platform. It is now shut in awaiting a market.

Block 67 field has only one well, but a platform has been erected for additional drilling.

The recently discovered Fresh Water Bayou field, about 10 miles north of Block 26, has three wells completed and a fourth one under way.

BRIEFS . . .

A tariff incorporating the revisions has been filed with the Interstate Commerce Commission. The service charge was started in 1942 to cover the increased cost of transport loading. Great Lakes had previously delivered solely into tank cars. Since then the charge has been revised several times.

Pacific Northwest Pipeline Corp. has awarded a contract to R. H. Fulton & Co., Lubbock, Tex., to build a 51-mile, 30-in. gas line in Wyoming. The line will parallel Pacific's 16-in. lateral from the Big Piney area to the main line in southwestern Wyoming. Construction will start this month and be completed by November 1.

Federated Pipe Lines, Ltd., an affiliate of Home Oil Co., Ltd., has awarded contracts to build a 130-mile crude line from Swan Hills southeast to Edmonton. The line will be 10-in. for most of its length and 12-in. for 6 miles near Edmonton. Mannix, Ltd., Calgary, will build the northern section and Banister Helm, Ltd., the southern section. The 40,000-bbl. daily line will be completed by November 1. Initially the line will be able to move 20,000 bbl. daily by gravity flow because of the elevation drop toward Edmonton.

Transcontinental Gas Pipe Line Corp. has awarded a contract for 65 miles of 24-in. in Louisiana to H. C. Price Co. Transco still has several hundred miles of construction scheduled for 1958.

Union Gas Co. of Canada, Ltd., will build 80 miles of transmission lines in Ontario this year to connect new markets and expand service to existing customers.

Pioneer Natural Gas Co. plans to build a 62-mile, 10-in. trunk line and 20 miles of gathering line this summer and fall. The $4,500,000 project will start near Pampa in Gray County, Texas Panhandle, and connect with Pioneer's main line near Canyon in Randall County. The line will add more than 25,000 M.c.f. daily to Pioneer's supply and will connect the cities of Pampa and Panhandle to the main line. Expansion to 50,000 M.c.f. daily is planned later with construction of a processing plant.

Also for Pipeliners . . .

IN THE NEWS: Jayhawk Pipeline will start up next month, giving southwestern Kansas and Oklahoma Panhandle producers a new outlet (p. 110) . . . Engineers have made huge Herscher storage dome usable despite leaks (p. 114).

A complete list of pipeline projects is published the last issue of each month. New jobs and contracts are reported each week in Pipeline Briefs.

PLUS THESE TECHNICAL REPORTS: Trans-Canada pipeline nearing completion (p. 204) . . . Emergency power for microwave stations (p. 225).

North Africa Is Humming

. . . with oil activity. More funds are earmarked as pipeline plans gel. Outlets, new concessions mean big play ahead.

IF THE POLITICAL troubles of the Middle East are having any effect at all on North Africa's oil boom, they are only increasing the activity.

Last week the French announced they intend to spend almost $435 million this year on oil development. Most of it is earmarked for Algeria where hastily spent French money is already producing oil.

In neighboring Tunisia, now almost certain to benefit from one Algerian pipeline, American and U. S.-Italian interests are trying to spread the boom to the east.

One big Algerian pipeline is already under way. Formal approval of the second through Tunisia to the Mediterranean appears certain. Drilling crews in four established Algerian fields are pushing tools to provide the oil for both lines.

Tunisian line . . . Only formal French Government approval of the route through Tunisia now stands in the way of a 24-in. line to move oil from the Edjele region to tidewater.

The line originally was planned as a 16-in. outlet, but was raised to 24 in. when Zarzaitine field proved bigger than early estimates.

Pres. Habib Bourguiba of Tunisia has made no secret of the fact he'd like to have the line cross Tunisia (OGJ, Oct. 21, 1957, p. 86). Late last month he approved an agreement between his country and TRAPSA, pipeline subsidiary of Cie. de Recherches et d'Exploitation de Petrole au Sahara (CREPS), to build the line through Tunisia.

Bourguiba has always given the Algerian rebels moral support and the French charge heatedly that his help has gone far beyond this stage. But his pipeline agreement angered the Algerian nationalists (OGJ, July 28, p. 120). Since then he has held talks with the French secretary general of foreign affairs and on at least two occasions hinted broadly to the Algerians that they might do better to talk with the French instead of battling them.

Paris certainly will not fail to press such an advantage of widening the rift between Bourguiba and the Algerians. The pipeline approval might do it.

CREPS is now at work building gathering systems in its three small fields to supply the pipeline. The company has completed 35 wells in Edjele, Tiguentourine, and Zarzaitine fields and plans at least 200 in all. The company believes it will need at least 200 wells for an initial output of 40,000 bbl. daily from the area.

CREPS has completed three wells in Zarzaitine and has two rigs running.

The southern terminal of the line is slated to be at In Amenas, north of Edjele and nearer Zarzaitine than the other two fields.

From here the line would move north along the Algerian-Libyan border to the southwestern corner of Tunisia where it would cross the boundary and then move straight north to El Shkirra just north of Gabes on the coast.

Ultimate capacity of the line would be 250,000 bbl. daily, with at least 600,000 bbl. storage at the Mediterranean terminal.

Reports from Tunis last week indicate CREPS has agreed to pay Tunisia almost $5 million a year in transit fees.

The Algerian line . . . Most of the land work for the big 24-in. line from Hassi Messaoud field to Bougie on the Algerian coast has been completed. The company is now negotiating with private landowners at Bougie, La Reunion, Oued Amizour, Tizi-Sahnadja, and Akabiou for right-of-way.

The first 15 miles of 24-in. pipe

has arrived at the double-jointing yard set up at Touggourt where automatic welding equipment shipped from the U. S. will be used.

Two spreads will be used on the line, and camps for the construction crews are now being built at several locations along the route. Entrepose Co. and Ste. Parisienne pour Industrie Electrique (SPIE) will lay 281 miles of desert line. SOCOMAN, French contracting company owned by a steel firm, will lay another 131 miles, most of it through mountains.

Capacity of the line when completed about the end of 1959 will be 101,760 bbl. daily with two pump stations. Throughput will be increased to 201,400 bbl. daily with a third station, and to 296,800 bbl. daily with a fourth.

At the Bougie terminal, electrical power installations, office buildings, and one 220,000-bbl. storage tank have already been completed. Another five tanks of the same size are being built.

While the line is under construction, Cie. Francaise de Petroles (Algerie) and Ste. Nationale de Recherches et d'Exploitation des Petroles en Algerie will continue to move production through the 6-in. line to Touggourt and then by rail to Philippeville.

These shipments have been stepped up continually since the small line was completed. During June the two companies moved an average of 10,543 bbl. daily.

New Tunisian concessions . . . A second American company with an Italian partner has moved into the Tunisian exploration picture (OGJ, July 28, p. 120).

The Tunisian Government is ready to grant a concession in four separate tracts, including some offshore islands, to Rimrock International Corp. and a wholly owned Italian affiliate, Soc. Oli Minerali, Palermo. The four areas total more than 6,000 sq. miles or about 4,870,000 acres.

The largest single block stretches across the waist of Tunisia from the Algerian border to the sea.

The other blocks include the extreme tip of Cap Bon, to the north of the country's productive gas field, a small area northwest of the Port of Gabes, and a small offshore block which includes the Ile de Djerba, the mythical land of the lotus eaters.

A large part of the acreage sought by SOM-Rimrock was once held by Ste. Nord Africaine des Petroles (SNAP), controlled by Gulf Oil. Gulf gave up its exploratory effort in Tunisia in 1954 after drilling five dry holes ranging from 3,900 to 12,053 ft.

One of SNAP's tests, a 5,623-ft. well, was on Djerba, where history tells us Ulysses stopped on his way home from the Trojan wars.

George S. Buchanan, president of Rimrock International, said last week that a convention signed by SOM and the Tunisian Government is still subject to certain conditions and requirements before it becomes effective.

The agreement is subject to approval by Rimrock's board of directors. The terms, he said, are comparable to concession agreements made by Conorada Petroleum Corp.

Only a few months ago, Conorada Petroleum Corp. (Continental, Amerada, and Ohio) agreed to spend $4 million in the next 5 years in an exploratory program covering almost 11,000 sq. miles of Tunisia (OGJ, May 5, p. 88). Conorada's program is just getting under way.

The only other company active in Tunisia is Ste. de Recherche et d'Exploitation des Petroles en Tunisie (SEREPT), which now has cut its concession area to a little more than 60,000 sq. km., most of it in the southern part of the country.

SEREPT's only success to date was the discovery of the Cap Bon gas field in 1948. The eight-well field produced an average of 582,500 cu. ft. of gas daily last year.

The gas is moved to Tunis through a 40-mile, 4-in. pipeline. SEREPT is owned 70% by the French Government and 30% by the Tunisian Government.

Big Texas Gulf Deal May Be Brewing in Libya

ONE of the liveliest rumors in the oil industry last week was a report that Texas Gulf Producing Co. may make a deal on some or all of its Libyan acreage.

No confirmation could be gained that the company might sell or farm out its concessions, but there was speculation from Wall Street to Caracas that a deal was in the making.

Reports that Standard Oil Co. (N. J.) was reaching an agreement with Texas Gulf were flatly denied by Jersey.

The company said it had talked a little about it to Texas Gulf, but that no deal was in the making. A spokesman added, however, that Jersey is always interested in prospecting acreage that may be available.

A Texas Gulf official said the company has been talking to "three or four companies" about Libyan acreage.

In the meantime, Texas Gulf is going ahead with a million-dollar geophysical program. Work will start soon on its Block 17 in the Sirti area.

Near Oasis discovery . . . There are at least two reasons why the time could be ripe for someone to make a move.

One is that Texas Gulf holds the large concession blocks in the vicinity of the Oasis Oil Co. of Libya (Ohio) discovery (OGJ, Aug. 11, p. 90).

Block 17, covering 1,740 sq. miles, adjoins Oasis discovery Block 32 on the west. One corner of Block 17 lies within about 10 miles of the discovery well, Bahi 1.

The company's 1,430-sq.-mile Block 16 and its adjoining 2,760-sq.-mile Block 18 are within about 50 miles of the discovery at one point. The blocks form a strip flanking the eastern edge of Mobil Oil's Block 11, which borders the Oasis block. Mobil Oil will soon start a second well.

Texas Gulf's Blocks 16 and 18 are bordered to the northeast by Esso Standard acreage and to the southeast by another Mobil Oil block. Esso's current test on Block 5, Oil Bugrea 1, is within a few miles of Texas Gulf acreage.

Financial aspect . . . The second reason why Texas Gulf might consider it an advantageous time to sell or farm out its acreage now is that despite its resources, it does not match the financial strength of the international companies on neighboring blocks.

The company has drilled at least five expensive dry holes east of Bengasi in Cyrenaica. More than 2 years ago it turned over 49% interest in its concessions in a financial deal with W. R. Grace & Co. Texas Gulf continues to own the operating subsidiary, Libyan American Oil Co., which holds title to the concessions.

Libyan American gave up two large tracts in Fezzan more than a year ago. The company at that time commented that the cost of exploration on the tracts, more than 500 miles south of the Mediterranean, was so high it was not interested.

Chinese Oil Hopes Soar

. . . as result of important discovery. Reds claim it'll solve nation's fuel problems, because it's big and accessible.

COMMUNIST CHINA is hailing its recent oil discovery in Szechwan Province as an event that "may change the face of the nation" and speed up by many years its industrial development program.

Information on the importance of the strike comes from the Russian newspaper Pravda, which quotes Chinese geologists as saying flatly: "With the Nanchung discovery, our nation's oil problem has been basically solved."

The new field is located about 100 miles northwest of Chungking near Nanchung in south-central China (OGJ, Apr. 21, 112) and is considered doubly important because of its size and its location on the banks of the Kialing River, a main tributary of the Yangtze.

According to Chinese statements, reported by Pravda, the wells completed in the field are at depths of about 5,000 ft., and one well is being turbodrilled to a depth objective of more than 9,800 ft. The report says there have been "gushers rising 100 ft. into the air."

China's ministry of the oil industry has ordered more than 100 deep-drilling rigs sent to Szechwan. Roads, housing, and river port facilities are under top-speed construction in the Nanchung-Chungking area, and a refinery also is being built.

What it means . . . The Chinese say that within 3 years the Szechwan field should provide "several times more oil than all other petroleum-producing regions of the nation taken together."

China's 1957 oil production amounted to less than 1.5 million metric tons, or about 30,700 bbl. per day.

Reports from Peking claim the Szechwan discoveries are "larger, richer, and more promising" than the Karamai field in the Dzungarian basin of far northwestern China.

Karamai and other Chinese oil regions—Yumen and Tsaidam basin in Tsinghai Province—are located in dry, remote, intemperate, and sparsely populated areas of the northwest. Water for Karamai, for example, is hauled 28 miles by truck from the Manass River and greater distances from other points.

Still under construction are the railroads which will carry oil-field equipment more than 1,200 miles from Lanchow to Karamai and from Lanchow to the Tsaidam basin.

By contrast, Szechwan is the most populous of China's provinces with more than 70 million people. From Chungking the navigable Yangtze River flows through China's economic heartland to the sea.

Weather in the Nanchung area is warm the year around—far different from the sandstorm-plagued northwestern oil provinces.

Drilling program . . . Russian-designed turbodrills are being used for much of the drilling around Nanchung. However, an increasing volume of equipment is being made in China.

Some of the drilling crew chiefs were trained in Russia's Grozny fields. Experienced personnel were transported to Szechwan from Yumen and other northwestern fields to help exploit the new discovery.

During "recent years" more than 380,000 ft. of exploratory hole has been drilled in Szechwan, according to Pravda. Besides the oil discovery at Nanchung, the Chinese claim to have found "rich deposits of natural gas" in the province.

Last spring reports from Hong Kong stated that the Chinese were moving some 3,400 oil-trained personnel into the new area.

The reports stated that three wells flowed more than 40 bbl. per hour on tests. The wells, widely separated, were drilled on three separate structures in an 850-sq.-mile area.

Second 5-year plan . . . One goal of Red China's second 5-year plan, which starts this year, is a crude production of 120,000 bbl. daily. The Chinese expect to reach the goal by the end of 1962.

Target for 1958 production is only a modest 7% increase to a daily average of 33,200 bbl. The Chinese themselves admit that crude oil will supply only a little more than half the increase for this year. Shale and synthetic oils and fuels distilled from coal will have to fill the gap.

The Chinese say they have found oil-shale reserves scattered over 20 provinces. They are planning shale-oil plants to process from 20 million to 50 million tons a year of the shale.

Before the Szechwan discovery, the Chinese expected the Yumen and Karamai fields to carry most of the burden of the planned oil production increase. They expect to double the production of Yumen, which supplies almost all of the present crude oil, and push Karamai to 60,000 bbl. daily by the end of 1962.

Signal Hits in Venezuela

SIGNAL Oil & Gas of Venezuela is continuing its record of successful wildcatting on the 43-sq.-mile Lake Maracaibo concession it operates for itself and three other companies.

A new pool discovery, the Centro 5-X, flowed 2,280 bbl. daily of 38.1°-gravity oil from Eocene sands. The discovery is 3 miles north of the nearest production at the Centro 3-X and 5 miles north of Centro 6-X completed last month (OGJ, Aug. 4, p. 69). All the wells are shut in pending completion of production facilities early this fall.

Iraq Ready to Talk Oil

. . . with IPC for first time since coup. No imminent danger to 50-50 split seen, but new leaders are under strong political pressure to win some ground.

WITH the smoke cleared on the political side of the Iraq revolution, the country is getting down to the main event this week as far as the oil industry is concerned.

Leaders of the new regime in the Republic of Iraq are due to set down their official position toward Iraq Petroleum Co., Ltd., (IPC). They will spell out what they want to G. H. Herridge, IPC managing director, who is expected in Baghdad after a visit to company facilities in Lebanon, Syria, and outlying Iraq.

On the surface there apparently is no danger to IPC's position. Key officials in the new government from Premier Abdul Karim El-Kassem on down have repeatedly insisted the need for doing business with IPC.

But at the same time they make it clear they expect to discuss the entire question of Iraq's agreements with IPC, including adjustments of profits and outstanding disputes.

The new government will be under strong political pressure to win ground from IPC. Herridge had left Iraq on the eve of the blood letting after agreeing to two demands of the defunct government.

IPC in a general way had agreed to increase crude production and to give up some of its acreage to let other oil companies in. Both these moves would result in increased oil income for Iraq. The new leaders will be counted on by their followers to do better.

IPC was already increasing its offtake facilities when the Nuri government fell last month. As a starter it is looping its 30 and 32-in. system from Kirkuk field to Banias, Syria, with 76 miles of large diameter pipe. The line now moves about 350,000 bbl. daily. A pair of 12 and 16-in. lines move another 150,000 bbl. daily from Kirkuk to Tripoli, Lebanon.

The company also is taking out the bottleneck holding down production in southern fields by building a new terminal on Shatt-Al-Arab River. The facilities will enable big, modern tankers to move crude from the southern area for the first time.

50-50 profit split . . . There is no immediate danger to the long-standing 50-50 profit split if the new leaders keep their word. And despite grumbling and bickering over negotiable points, no major Arab government has yet broken its word on a concession deal.

If the new government keeps its word it could not arbitrarily change the 50-50 profit split for more than 40 years. IPC's own concession expires in the year 2000. Rights of its affiliated companies in Iraq, Mosul Petroleum and Basrah Petroleum, expire in 2007 and 2013.

Legally, IPC's agreement is subject to change only if other Middle East countries get a getter deal. Contracts which a Japanese firm holds for Neutral Zone rights and deals made by Italy and by Standard Oil Co. (Ind.) look better on paper.

But IPC will have a strong argument that the new contracts are not now producing any revenue. It probably will be years before it could be possible to compare figures to see under which type of contract a country would gain most.

On the negative side, four powerful people in the new government resigned from elective jobs back in 1952 in protest against the concession agreement signed with IPC that year. All favored an oil nationalization political line. They were Sadik Shanshal, now minister of guidance, Mohammed Hadid, finance minister, Abdul Jabbar Jomard, foreign minister, and Mohammed Mahdi Kubba, one of the three members of the top-level presidential council.

American companies hold 23¾% interest in IPC through Near East Development Corp., owned jointly by Socony Mobil Oil Co. and Standard Oil Co. (N. J.) Other owners are British Petroleum Co., Royal Dutch-Shell, and Cie. Francaise des Petroles, each with 23¾% participations, and Exploration Corp. (C. S. Gulbenkian estate) with 5%.

Paria Test Nears Objective

THE second test on the Venezuelan side of the Gulf of Paria is nearing its objective.

Paria Operations, Inc., is drilling ahead at 10,800 ft. in Posa 103-A-1. Projected depth of the test is 11,000 to 11,500 ft.

The well is being drilled from a permanent platform 4 miles northwest of the initial discovery on acreage held by Paria Operations. The company is owned by Continental Oil Co., The Texas Co. and Ohio Oil Co., each with 25%; Cities Service, with 16⅔%; and Richfield Oil Corp., with 8⅓%.

Loffland Brothers Co., Tulsa, will move a second rig into the Gulf of Paria this fall. It will drill from a 110 by 112-ft. concrete platform, designed to handle more than 25 deviated wells at the discovery site.

Posa 112-1 was dually completed. It drill-stem tested 1,500 bbl. daily of 20°-gravity crude from two zones between 4,000 and 4,500 ft. The well is about 10 miles west of the 2,000-bbl. daily Soldado offshore field on the Trinidad side of the gulf.

India Studies Plan

to build one large refinery instead of two small ones.

INDIA may make an eleventh hour change in its refinery program in Assam.

The government has already made up its mind to build a plant of less than 20,000 bbl. at Gauhati, Assam, to be followed later by a larger refinery at Barauni, in Bihar State. Both plants are—or were—to be fed by a crude pipeline from Nahorkatiya field, which is rated at 50,000 bbl. daily.

But American consultants hired to study the program have made their final report. They recommend one large refinery at the field, with a products pipeline extending to marketing centers.

This report is a fly in the ointment causing the government to rehash plans which are well under way. The government has already tentatively accepted a Romanian offer to build a 15,000-bbl. plant at Gauhati. An Indian delegation is now in Bucharest working out details.

The government will own whatever refining facilities are built. But it will have only one-third interest in India Oil, Ltd., which will operate the pipeline as well as the crude production. Assam Oil Co. will own the remaining two-thirds interest. India Oil was formed on the basis of plans for two refineries and a crude line.

Even if the government chooses to go ahead with its original plans, it will still probably face the ire of the local Assam government. The national government wasn't going to build at Assam at all, but gave in to prolonged political agitation. The local government is still pressing for a larger plant in Assam, and the new report is right down its alley.

Argentina Oil Plan Unfolding

. . . as Brazil keeps close watch. Pan Am outlines details of drilling program. Revision sought for Loeb contract.

ARGENTINA'S bold plan to resolve its oil troubles by bringing in foreign investment without granting concessions unfolded rapidly last week.

The country hopes to contract upwards of $1 billion worth of development work to stave off the growing cost of petroleum imports. Pres. Arturo Frondizi's government is busy negotiating and signing contracts in the face of possible ultranationalistic reaction.

In the past, this opposition has toppled governments which tampered with the country's oil policy (OGJ, Aug. 4, p. 70).

In the latest developments:

. . . **Pan American International** (Indiana Standard) revealed details of a drilling program that will cost at least $60 million.

. . . **A possible hitch** arose over some parts of the $100-million contract signed by Carl Loeb, Rhoades & Co.

. . . **Neighboring Brazil** began to wonder whether it ought to keep up with the Joneses to the south.

Pan Am deal . . . C. F. Dohm, president of Pan American, said the company's agreement covers three structures in the provinces of Chubut and Santa Cruz. They are Anticlinal Grande, known as Sarmiento, Cerro Dragon, and Canadon Grande, where Yacimientos Petroliferos Fiscales (YPF) already has production.

During the first year of the 15-year contract, Pan American will drill 50 wells, 10 in Sarmiento and 40 in Cerro Dragon. Five rigs will be used.

Depending on results of the first year, the company will drill 100 wells the second year, including 20 at Sarmiento and 70 at Cerro Dragon. Ten rigs will be used. A pipeline also will be built.

The company hopes to deliver 30,000 bbl. daily to YPF within 2 years. This would increase Argentine output about one-third. It will receive $1.59 per barrel after payment of taxes for all crude deliveries. Sixty per cent will be payable in dollars, the rest in pesos. The company has an option to extend the contract for 5 years.

Seek revision . . . The government has asked Carl Loeb, Rhoades & Co. to change two clauses in the $100-million contract for drilling and development in an unspecified area.

One clause deals with the joint operations committee with YPF, which would have the last word in all major technical questions. Critics say Loeb, Rhoades & Co. would have the final authority on the committee, taking away YPF's control of oil fields.

Nationalists and other opposition also want a change in the form of payment to the company. This clause in the contract calls for a payment of half the value of every barrel of oil on the basis of laid-down price at Argentine ports. It also provides for automatic amortization of the banking firm's investment.

The government apparently is asking Loeb, Rhoades to renegotiate the points because of domestic opposition. Some parts of the contract dealing with development areas have yet to be settled. But Loeb, Rhoades in New York said the clauses under question have already been agreed upon.

The contract is final pending proclamation by the president. He announced the agreement during his historic television broadcast. But evidently this is not technically a proclamation.

Brazil watches closely . . . The Argentine move came at a time when Brazil's old oil controversy was being rekindled.

The Brazilians pressed hard for United States loans, or loan guarantees, to Petrobras during a visit by Secretary of State John Foster Dulles.

Dulles turned down the request flatly. This left the Brazilians with little alternative except to study the compromise formula being used by Argentina, if it wants to bring in foreign capital at all.

WORLD BRIEFS . . .

Caltex is the latest company to set down a heavy rig in Libya. Its exploration subsidiary, American Overseas Petroleum Co., has an outfit en route to Block 47, about 230 miles southeast of Tripoli. The company made a small-scale strike at 120 ft. in a strat test on the concession earlier this year.

Aramco's new mobile drilling platform is starting its first well in Manifa field off Saudi Arabia. The three-sided platform, called No. 1, is operating in conjunction with the Queen Mary drilling barge.

Saudi Arabia's first alkylation unit is under construction at the 189,000-bbl. Ras Tanura refinery. The $7-million plant is expected to go on stream next June, producing 1,210 bbl. daily of light alkylate for aviation gasoline. M. W. Kellogg Co. designed the unit.

Cay Sal 1 in the Bahamas Islands is drilling ahead at 6,620 ft. after being plugged back to 6,000 ft. and sidetracked. Drill pipe reportedly was lost at 9,492 ft. Standard Oil Co. of California and Gulf Oil Corp. may spend up to $3 million on the joint test.

Lake Maracaibo crude production dropped 250,000 bbl. during the July 23 nationwide general strike in Venezuela. The strike was called in support of the temporary ruling junta, which was briefly threatened by a dissident faction (OGJ, Aug. 4, p. 72).

Japan's second combination UOP Unifining-Platforming unit is now on stream at the Yokohama refinery of Nippon Petroleum Refining Co., Ltd. The new unit is processing naphtha derived from Middle East crudes. Design capacity is 3,300 bbl. daily.

The Pakistan Government has decided to locate its proposed refinery at Keamari Groyne on Karachi Harbor. The site was recommended in a study made by four companies.

Romanian natural-gas deliveries to Hungary will start this fall with completion of a 206-mile pipeline. A petrochemical center under construction at Tiszaplakoyan, Hungary, will produce plastics and nitrogen fertilizers.

Work has started on a 40,000-bbl. refinery south of Oslo, near Tonsberg, Norway. A/S Esso-Raffineriet, Norge, expects to open the plant in 1960.

Petrobras has increased asphalt production at its Cubatao refinery to more than 2,200 bbl. daily. The plant now supplies 90% of Brazil's asphalt needs.

Esso Standard of Paraguay has submitted a $3-million refining and transportation program for government consideration. The project would include a refinery at Asuncion.

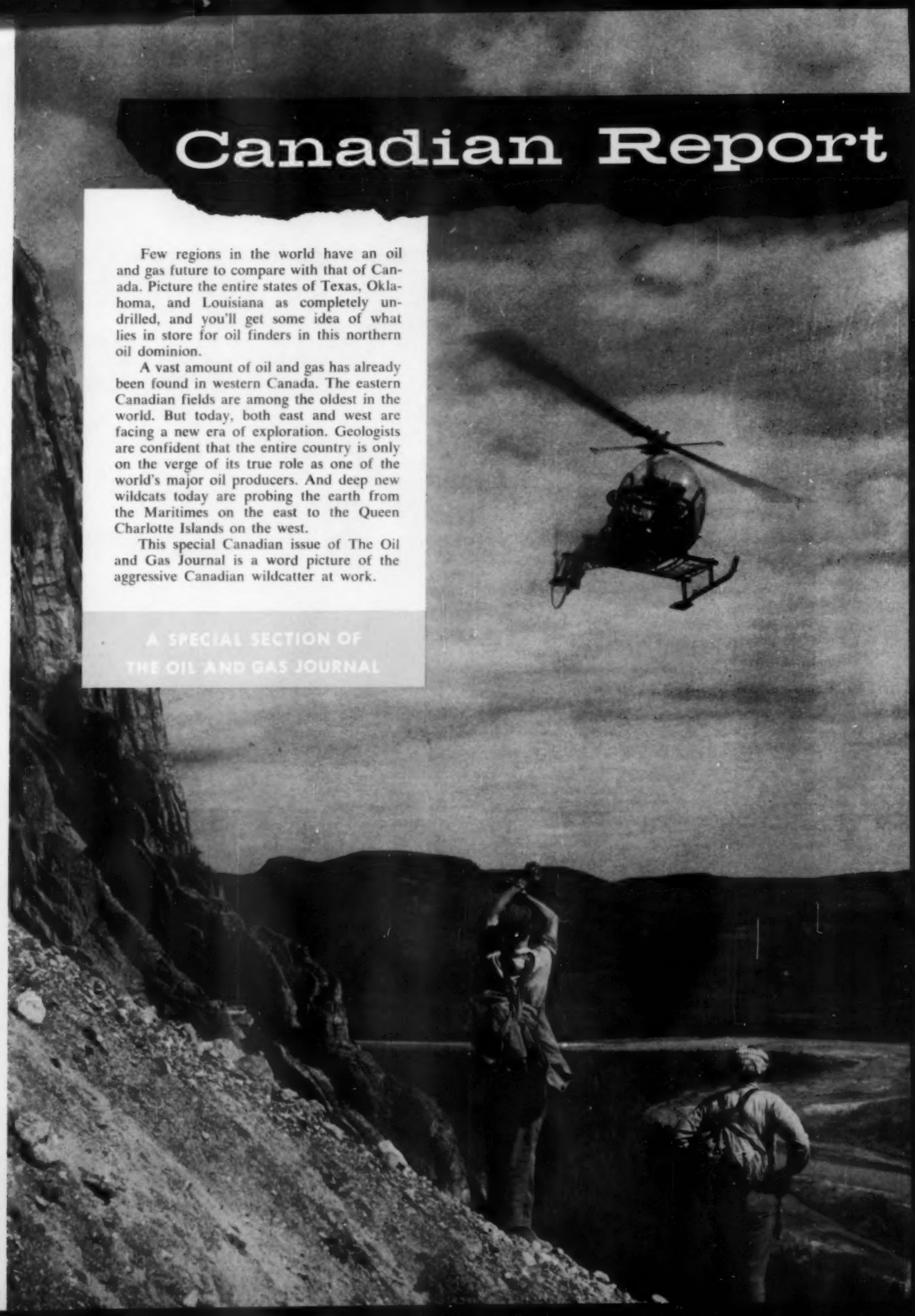
Canadian Report

Few regions in the world have an oil and gas future to compare with that of Canada. Picture the entire states of Texas, Oklahoma, and Louisiana as completely undrilled, and you'll get some idea of what lies in store for oil finders in this northern oil dominion.

A vast amount of oil and gas has already been found in western Canada. The eastern Canadian fields are among the oldest in the world. But today, both east and west are facing a new era of exploration. Geologists are confident that the entire country is only on the verge of its true role as one of the world's major oil producers. And deep new wildcats today are probing the earth from the Maritimes on the east to the Queen Charlotte Islands on the west.

This special Canadian issue of The Oil and Gas Journal is a word picture of the aggressive Canadian wildcatter at work.

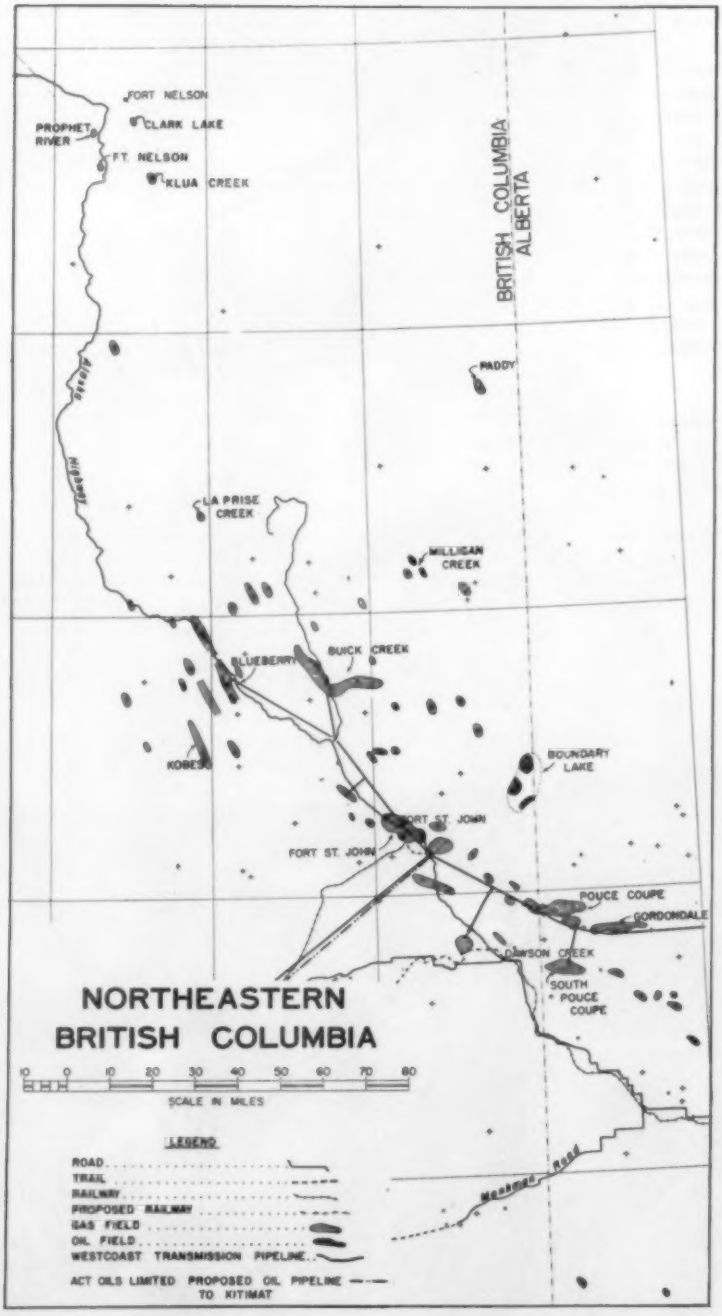
A SPECIAL SECTION OF
THE OIL AND GAS JOURNAL



Northeastern British Columbia—
GIANT OF THE FUTURE

. . . where wildcat success swings from 45 to 49%

BY G. L. GRAY

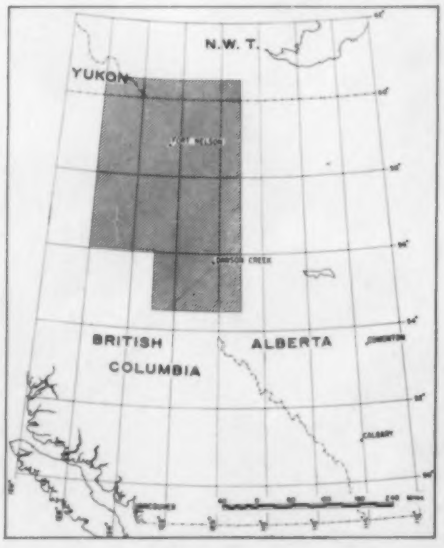


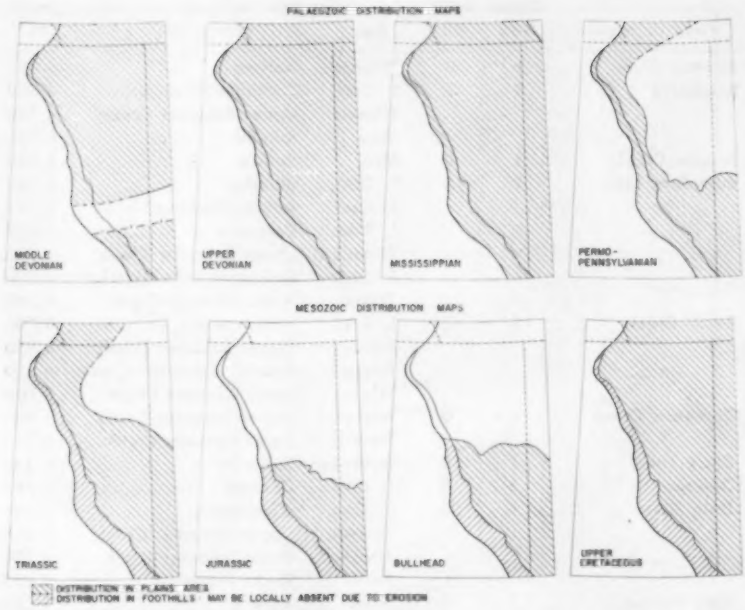
PART 1

NORTHEASTERN British Columbia, although a comparative youngster oil-wise, has had an enviable success ratio. Out of 232 wells drilled as exploratory ventures, some 104 have indicated success. This is a wildcat discovery rate of 45%. However, during the past year, of 61 exploratory completions, 30 were discoveries for an extremely high success ratio of 49%. There were 94 total completions.

Except for a portion of the Liard basin to the north, northeastern British Columbia may be divided into three main provinces: (1) the Rocky Mountains, (2) the Foothills, and (3) a northern extension of the Alberta basin. The latter basin holds the thickest section of sedimentary beds known anywhere in western Canada, particularly south of Dawson Creek and in a belt paralleling the foothills. Since all post-Devonian formations thin in an easterly direction, pinch-outs will provide an unknown

DEVELOPMENT MAP of northeastern British Columbia displays what has been accomplished in the last 10 years there. Index map below outlines (shaded) area under discussion. Fig. 1.





DISTRIBUTION MAPS reveal the areal extent of Mesozoic and Paleozoic sediments in northeastern British Columbia. Fig. 2-A (top) and 2-B (bottom).

number of stratigraphic traps in addition to the numerous anticlinal structures which are known to exist.

Practically all of this area is now under permit or lease and amounts to some 26 million acres in British Columbia. This part of the Alberta basin contains about 80,000 cu. miles of sedimentary rocks and can, therefore, be expected to provide large reserves of oil and gas.

The most heavily drilled area covers some 2 million acres in the general vicinity of Dawson Creek and Fort St. John, with the Peace River and the Alaska Highway transecting the heart of it. This area contains 80% of all wells drilled in northeastern British Columbia but covers only 8% of the land area east of the mountain front. The well density here is only one well per 15,000 acres. However, the well density in the remaining portion east of the mountain front is only one well per 750,000 acres.

Fig. 1 shows northeastern British Columbia and the adjacent portions of Alberta, Yukon, and the Northwest Territories. The individual wells indicate those that were used in the regional geologic study. Table 1 displays data on the oil and gas reservoirs that have been discovered so far.

Today, only two fields are considered to be fully developed—West Buick Creek and Fort St. John gas fields.

Recent gains . . . Monthly gas production from fields connected to the Westcoast system reached 9,173,978 M.c.f. in March 1958, for a daily average of 295,935 M.c.f. During the same period, oil production from Northeast British Columbia averaged 1,800 bbl. per day.

Drilling activity for the first 4 months of this year is up over the same period a year ago with an approximate increase of 11% in total footage drilled.

And new discoveries . . . The most significant strike so far this year was Dome Exploration, Ltd.'s, Laprise Creek wildcat that discovered a 135-ft. gas pay in the Triassic "B" horizon at 4,383 ft. This well was completed in March with an absolute open-flow rating of 25 M.M.c.f.d.

Another significant development was a successful oil-confirmation test about ¾ mile southwest of the Hudson's Bay-Union Milligan Creek discovery. Previously the discovery was completed from the Triassic "D" zone sand at a depth of 3,700 ft. and flowed 38°-gravity oil at the rate of 210 bbl. per day through 20/64-in. choke. The follow-up well, H.B.-Union D-64-G Milligan Creek was completed in the same horizon for 480 bbl. per day.

At about the same time, Triad Oil Co., Ltd.'s, 1 Beatton River wildcat, 4½ miles north-northwest of the Milligan Creek discovery, found oil in the same horizon. It recovered 3,500 ft. of 40°-gravity oil plus 200 ft. of gas-cut mud and no water on drill-stem test at 3,730-70 ft. it is now awaiting completion.

Important new gas fields have been discovered in the Middle Devonian Slave Point formation at three places in the Fort Nelson area. These three, Prophet River, Clark Lake, and Klua Creek, together with a Mississippian discovery at Fort Nelson, further demonstrate the gas potential of Northeast British Columbia. The Slave Point has also been found productive of gas some 90 miles southeast of the Fort Nelson area at Paddy, near the Alberta boundary.

This is the first published study

of the regional geology of northeastern British Columbia, an important future Canadian oil and gas province. Exclusively prepared for the Journal, the paper will serve as an important reference and starting point for all who intend to conduct exploration in that region. Part 2, "Stratigraphy," which will appear in next week's issue, will include a series of isopach and structure maps.

The author, shown in the photo with his two partners (pointing at map) is a graduate of Colorado School of Mines with a degree in geological engineering. He was geologist in the Mid-Continent area for Skelly Oil Co. for 4 years, and prior to joining the firm of Hunt (center in photo), Ratcliffe (left in photo), & Gray, he was employed by Canada Southern Petroleum, Ltd., for 4 years as geological engineer.

Pipelines, Processing Plants, and Refining Facilities

At present, Northeastern British Columbia is served by one major transmission system, that of Westcoast Transmission Co., Ltd. This system has some 650 miles of 30-in.-diameter main line to transport natural gas from the fields in this region. The line begins at Taylor, B.C., on the Peace River between Fort. St. John and Dawson Creek and proceeds generally southwest along the John Hart Highway to Prince George, then south through the Frazer River Valley to Williams Lake where it runs cross-country via Savona and Merritt to Hope and the terminus near Sumas.

The main Westcoast line was originally designed to handle eight compressor stations. At present, the odd-numbered stations have been constructed and these four have horsepower to provide the line with a capacity of approximately 400,000 M.c.f.d. However, the capacity can be increased to 660,000 M.c.f.d. by constructing the proposed four additional compressor stations.

Extensions coming . . . The original gathering system consisted of about 135 miles of line in Alberta and 92 miles in British Columbia. The system is now being extended northwest to take gas from Blueberry, Highway, Kobes Creek, and Halfway fields. Previously such fields as Fort St. John, West Buick Creek, Montney, Red Creek, and Parkland had been placed on stream when the system was completed in the late fall of 1957. In addition, the Alberta fields of Pouce Coupe, South Pouce Coupe, and Gordondale have been tied in.

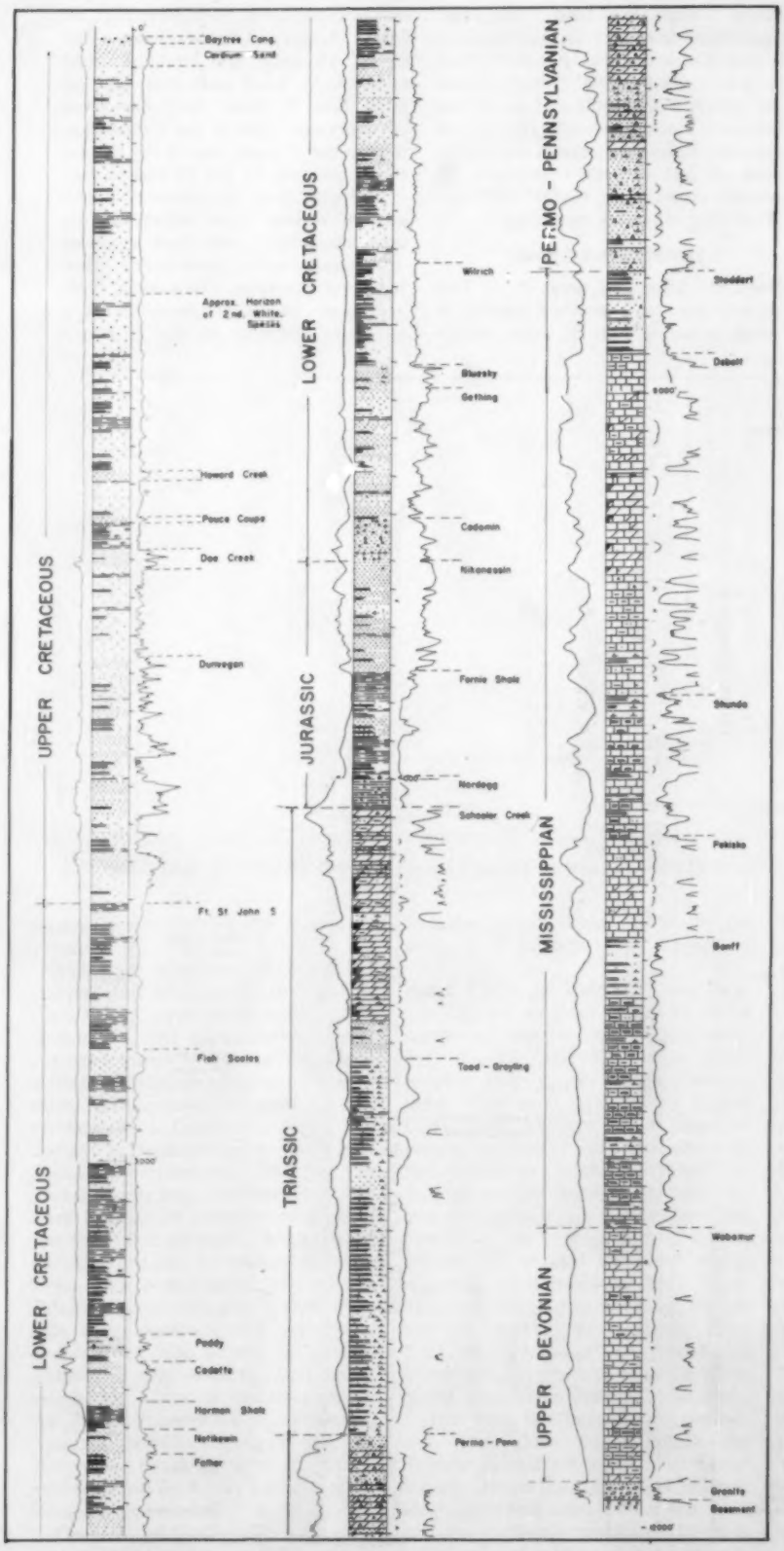
These latter fields are primarily sweet and dry gas and the gas is taken to the Taylor compressor station where it enters the main system. On the other hand, most of the gas fields in British Columbia, particularly those north of the Peace River, are from geologically older (and deeper) horizons and are primarily wet (condensate bearing) and sour (hydrogen sulfide bearing). Consequently a large gas-processing plant has been built at Taylor to remove byproducts prior to transmission.

The scrubbing plant constructed by Westcoast is designed to process sufficient raw gas to produce 300,000 M.c.f.d. of dry specification pipeline gas with byproduct production of 18% of the propanes, 68% of the butanes, and essentially all of the liquid hydrocarbons contained in the raw gas fed to the plant.

Refining . . . The refining plant located at Taylor as originally planned was to consist of a feed-preparation unit to produce feed stocks for further processing, a hydrocarbon

TABLE 1—OIL AND GAS RESERVOIRS IN NORTHEASTERN BRITISH COLUMBIA

Field or area—	Comp. wells— Gas	Oil	Pay horizons— Age	Formation	Average depth (ft.)
Beatton River	1	0	Triassic	Halfway	6,500
Blueberry	9	3	L. Cret.	Cadomin-Nikanassin	4,300
			Triassic	Upper Schooler Creek	4,700
			Miss.	Rundle	6,900
Bougie Creek	1	0	Miss.	Rundle	6,250
Boundary Lake	2	16	L. Cret.	Bluesky	3,580
			L. Cret.	Middle Gething	3,600
			L. Cret.	Cadomin	3,850
			Triassic	Upper Schooler Creek	4,000
			Triassic	Boundary Lake Member	4,200
			Triassic	Basal Schooler Creek	4,500
Buick Creek	18	2	L. Cret.	Nikanassin	3,700
			Triassic	Upper Schooler Creek	3,950
			Triassic	Middle Schooler Creek	4,150
			Triassic	Basal Schooler Creek	4,700
Cameron Creek	2	0	Triassic	Upper Schooler Creek	5,090
			Triassic	Basal Schooler Creek	6,180
Clark Lake	1	0	Devonian	Slave Point	6,344
Dawson	3	0	L. Cret.	Cadotte	2,780
Doig River	4	0	L. Cret.	Nikanassin	3,680
			Triassic	Upper Schooler Creek	3,650
			Triassic	Basal Schooler Creek	4,200
			Penn.	Rocky Mountain	5,025
Fort Nelson	1	0	Miss.	Rundle	2,300
Fort St. John	48	5	L. Cret.	Gething	3,300
			L. Cret.	Cadomin	3,400
			Triassic	Upper Schooler Creek	4,100
			Triassic	Middle Schooler Creek	4,600
			Triassic	Basal Schooler Creek	5,100
			Penn.	Rocky Mountain	6,400
			Miss.	Rundle	7,000
Gundy Creek	4	0	Triassic	Upper Schooler Creek	4,700
			Triassic	Middle Schooler Creek	5,600
Halfway	3	0	Triassic	Upper Schooler Creek	3,750
			Triassic	Basal Schooler Creek	5,050
Highway	6	0	L. Cret.	Nikanassin	4,430
			Triassic	Upper Schooler Creek	4,700
			Miss.	Rundle	6,800
Kiskatinaw	3	0	L. Cret.	Cadomin	4,000
			Triassic	Upper Schooler Creek	4,750
			Triassic	Middle Schooler Creek	5,600
Klua Creek	1	0	M. Dev.	Slave Point	6,850
Kobes	5	0	L. Cret.	Cadomin	2,750
			Triassic	Middle Schooler Creek	4,850
			Triassic	Basal Schooler Creek	5,000
			Penn.	Rocky Mountain	6,600
			Miss.	Rundle	6,900
Laprise Creek	1	0	Triassic	Upper Schooler Creek	4,382
Milligan	3	0	L. Cret.	Basal Gething	3,700
			Triassic	Schooler Creek	3,800
			Triassic	Basal Schooler Creek	3,750
Milligan Creek	0	2	Triassic	Halfway	3,705
Montney	3	0	L. Cret.	Gething	3,650
			Triassic	Middle Schooler Creek	4,300
			Triassic	Basal Schooler Creek	4,830
Nig Creek	3	0	Triassic	Upper Schooler Creek	4,400
N. Milligan Creek	0	1	Triassic	Halfway	3,734
Paddy	1	0	M. Dev.	Slave Point	7,920
Parkland	2	0	Penn.	Rocky Mountain	6,970
			Miss.	Stoddart	8,300
			Devonian	Wabamun	10,900
Pouce Coupe	3	0	L. Cret.	Cadotte	2,150
			L. Cret.	Notikewin	2,450
Prophet River	1	0	M. Dev.	Slave Point	6,550
Red River	3	0	Triassic	Upper Schooler Creek	4,300
			Triassic	Middle Schooler Creek	5,000
			Triassic	Basal Schooler Creek	5,300
Stoddard	2	0	Penn.	Rocky Mountain	6,340
Sunrise	3	0	L. Cret.	Cadotte	3,100



SECTION of a theoretical well in the general area of Dawson Creek. Fig. 3.

distillation plant to separate the various hydrocarbon byproducts, and a catalytic desulfurizer and reformer to process raw natural gasoline into high-grade motor-gasoline blending stocks. This plant is jointly owned by Pacific Petroleums and Phillips Petroleum Co. Plans have been made to construct additions consisting of fractionation, dehydrogenation, isomerization, alkylation, and blending facilities for the further upgrading of plant liquids into marketable products including high-octane aviation gasoline.

There is now substantially no market in the area for butanes and consequently the initial design of the refining plant contemplates the minimum recovery of that product. The market for liquid fuels, including motor gasoline, diesel fuel, and propane, in the region of the general Peace River area and extending south to Prince George in the interior of British Columbia and north to Fairbanks, Alaska, is one of the highest-priced markets on the North American Continent.

In addition to the installations at Taylor, a small 3,000-bbl. per day refinery is located at Dawson Creek. This refinery takes crude from Boundary Lake field and wells in the Fort St. John area.

Sulfur . . . In conjunction with the other facilities at Taylor, Jefferson Lake Sulphur Co. has constructed a sulfur plant for processing acid gas removed from the raw gas stream. This plant has an initial daily design capacity of 300 long tons of sulfur.

New line to west . . . Act Oils, Ltd., has applied to the British Columbia government to construct a major oil line from the Peace River area Northeast British Columbia and adjacent Alberta to Kitimat on the British Columbia coast. The length of this proposed line is 478 miles from Fort St. John, with the elevation of the major passes traversed being only 3,400 ft. at Pine Pass and 3,100 ft. at Telkwa Pass. According to an economic study made by Act Oils, the company has estimated that by 1963 sufficient oil reserves will have been developed in the area to justify a large-diameter transmission line. The deep-water port at Kitimat would serve as a shipping point to West Coast and Alaskan markets.

Exploration History

The first geological investigations of northeastern British Columbia began in 1880 but were confined to the Rocky Mountains and the foothills belt. Subsurface exploration was

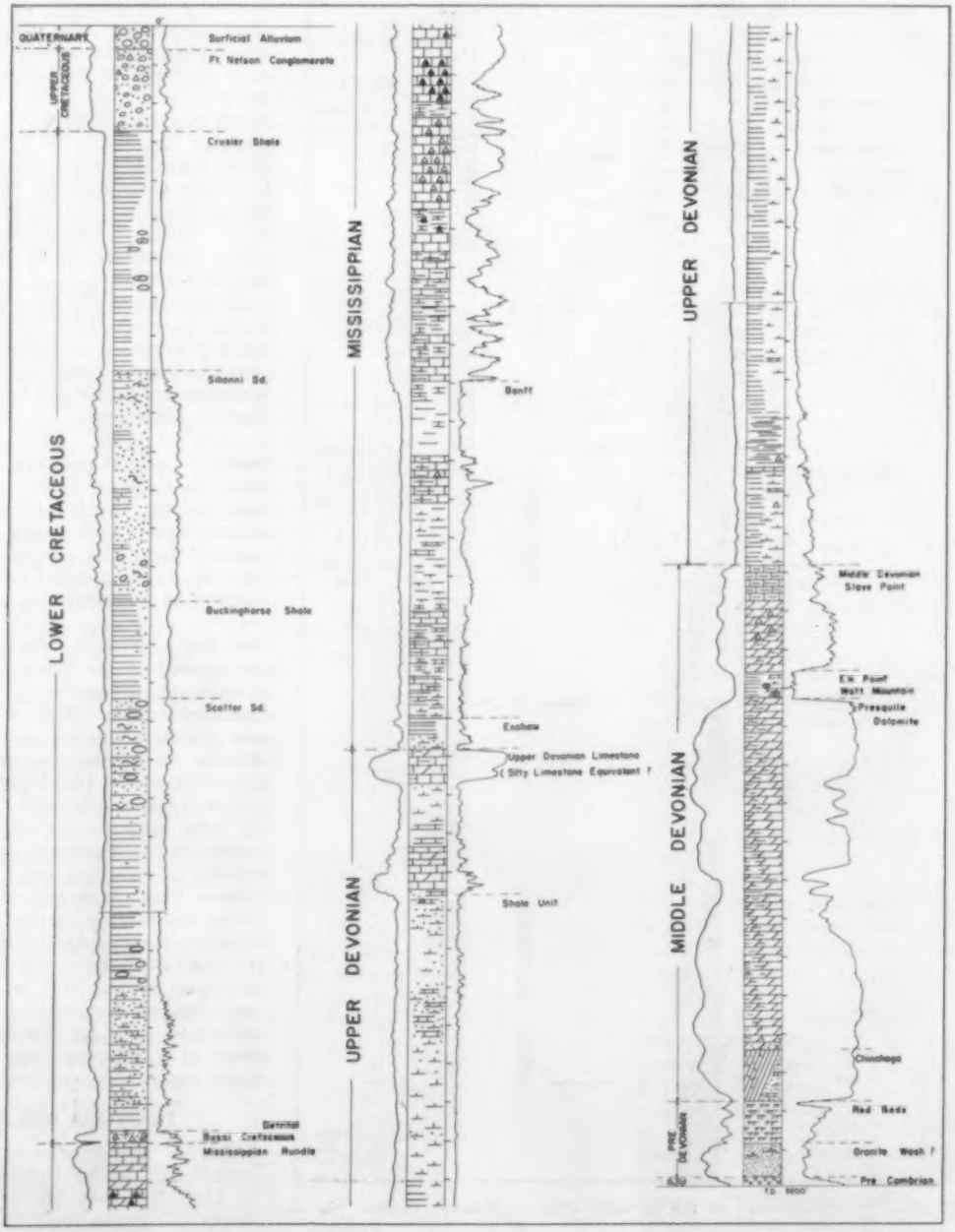
initiated with the drilling of 1 Pine River by the British Columbia government in 1941-42. When the Alaska Highway was completed in 1944, geological survey crews were able to extend their activities well within the area. These surveys led to the drilling of such important pioneer wildcat wells as Phillips Daiber in 1950 and Phillips Tenaka in 1951.

The first commercial gas wells were drilled in 1948 by Peace River Natural Gas Co., Ltd., some 15 miles northeast of Dawson Creek; these later proved to be a westward extension of Pouce Coupe gas field. The most significant discovery in northeastern British Columbia was Pacific 3 Fort St. John drilled in 1952, which proved the presence of commercial gas in two horizons. Since then exploration in the area has steadily increased, and at the peak of last winter's operations, 22 seismic crews were in the field and 30 drilling rigs were operating.

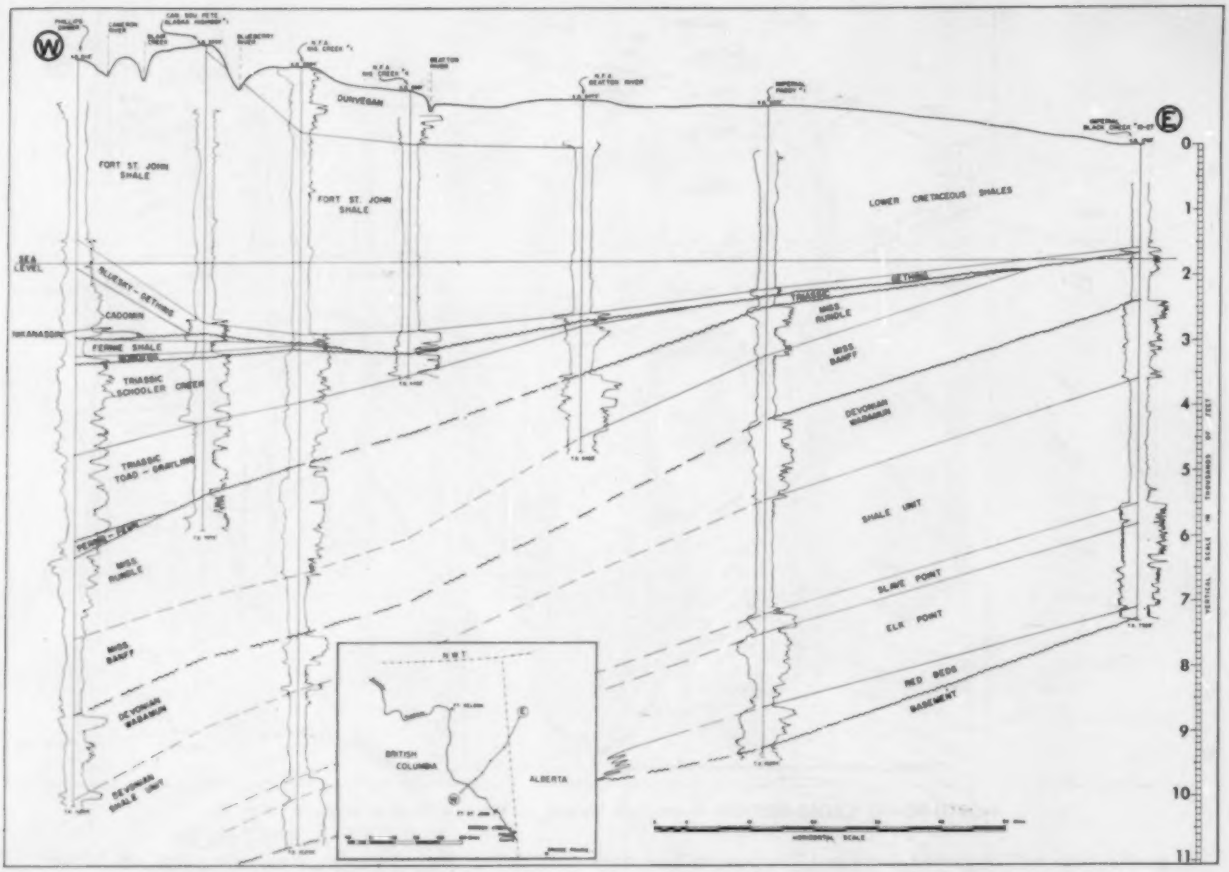
Description of Pools

Fort St. John gas area . . . This prolific gas area contains a number of fields including Fort St. John, Southeast Fort St. John, Northwest Fort St. John, Airport, Charlie Lake, Red Creek, Montney, and Stoddart. Most of the fields have more than one gas pool. Fort St. John field has seven pay horizons—one in the Cretaceous, four in the Triassic, one in the Permo-Penn, and one in the Mississippian.

The geological conditions that create the various traps within this gas area are similar, with both structure and stratigraphic phenomena playing important roles. The various fields are local structural anomalies with gas-water contacts on the structural



SECTION of a theoretical well in the general area of Fort Nelson. Fig. 4.



WEST-EAST CROSS-SECTION showing subsurface relation of beds in northeastern British Columbia. Fig. 5.

flanks usually limiting the productive areas.

Although structure plays an important part in trapping the gas accumulations, local stratigraphic conditions within this area determine what horizons within a specific field have sufficient reservoir properties to make them economically attractive. The productive acreage for any one horizon is delimited in part by local porosity developments. That is, the productive acreage is sometimes confined by lack of porosity, to an area less than that normally delimited by the structure and its associated water level. This is especially true of the Triassic Upper Schooler Creek horizons where local induced porosity at or near the unconformable erosion surface is quite variable. To a lesser extent, the same condition exists in the Permo-Penn horizon. However, here the porosity developments are due more to differences in clastic sorting within the highly variable lithofacies of this deposit.

The fields in the Fort St. John area are anticlinal and appear to have a general structural trend striking west-northwest. Local prominences on the broader general folds serve as the controlling structural-type traps.

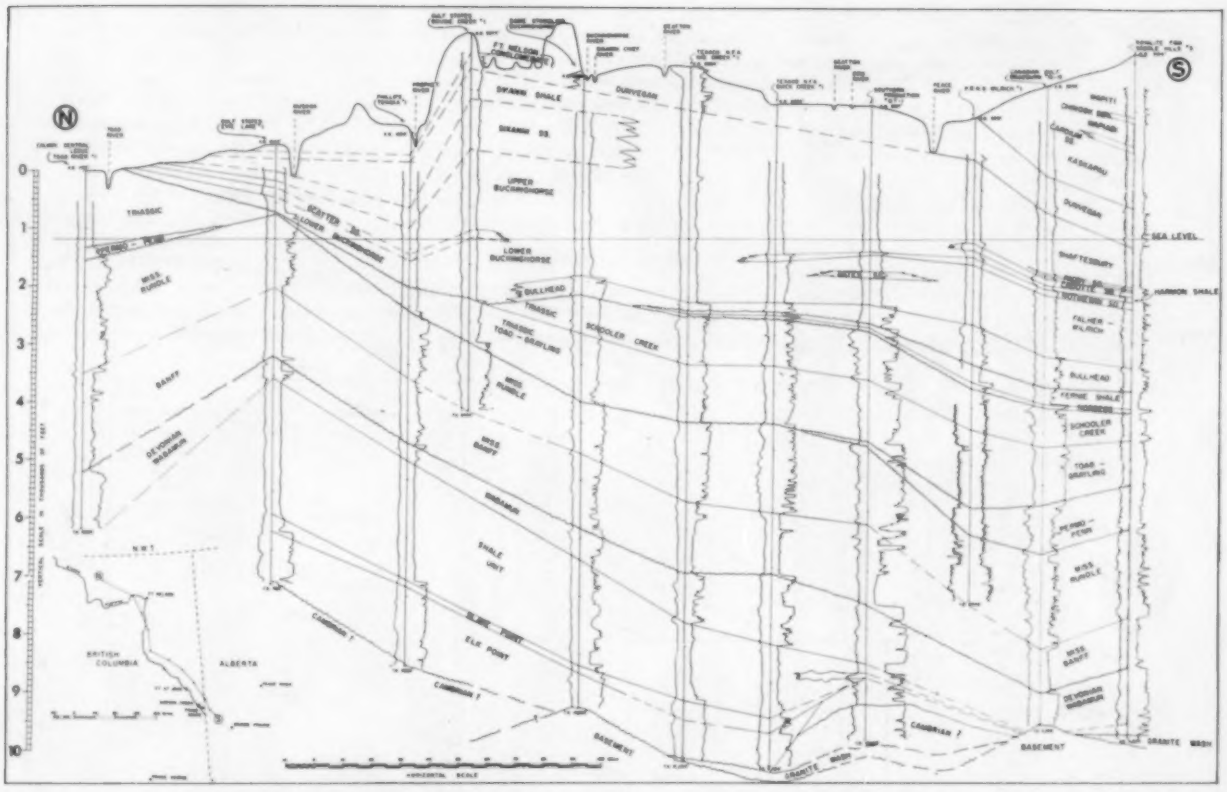
Buick Creek gas field . . . This large gas deposit situated some 35 miles north-northwest of Fort St. John townsite, consists primarily of a stratigraphic trap in the lower Gething sand. This sand, within the Lower Cretaceous, appears as a lense of porous near-shore marine sandstone that pinches out to the north and east through normal depositional phenomena. In addition to the stratigraphic nature of the trap, the reservoir is folded with several structural trends appearing to transect the field. These have played a part in localizing the gas deposits within the Gething sand body. As evidence of this, West Buick Creek field appears to have an associated oil column along the east flank.

This field has been found productive from three zones within the Triassic in addition to the Gething reservoir. These latter horizons indicate local accumulations within the area and are probably controlled by both structural and stratigraphic conditions similar to those found in the Fort St. John area.

Blueberry-Highway gas area . . . This gas area is a series of fields situated some 50 miles northwest of Fort St. John townsite and straddling the Alaska Highway. For the most part these accumulations follow, and are controlled by anticlinal trends striking north-northwest and extending a distance of some 20 miles. However, once again stratigraphic conditions seem to play an important part in localizing the gas reservoirs.

A significant oil strike was made in this area last year when three widely spaced wells encountered an oil column on the west flank of Blueberry gas field. This reserve is within the upper carbonates of the Mississippian.

Boundary Lake area . . . This area was the site of the first commercial oil discovery in northeastern British Columbia. The main reservoir is the Triassic Boundary Lake dolomite, some 250 ft. below the top of the Triassic. This horizon is widespread with oil production occurring over an area some 6 miles wide and 10 miles long. At present some 16 oil wells have been completed within this



NORTH-SOUTH CROSS-SECTION from Fort Nelson to Grande Prairie regions. Fig. 6.

general area with a proven developed area of about 2,560 acres.

The trap appears to be a regional stratigraphic pinchout of porosity as the carbonates are replaced updip with clastic red beds and siltstones. To date no associated water table has been found.

Although the field is in the early stages of development, is appears quite possible that a major oil field could be present. In addition to the oil in the Boundary Lake member, the field has been found productive in several other horizons in the southwest development sector. Gas has been discovered in the Bluesky, Gething, Cadomin, and three horizons in the Triassic. Two gas wells have been drilled in addition to the oil development wells. Local structure and local stratigraphic conditions play an important part in delimiting the accumulations particularly in the southwest development sector.

Kobes gas area . . . This area has found gas in the Lower Cretaceous Cadomin formations, the Triassic Halfway formation, and in the Permo-Penn and Mississippian. Production is localized along a strong anticlinal trend striking NW-SE. The section appears to be faulted in the Lower Triassic and Paleozoic and these faults appear to have some control over the deeper accumulations.

Pouce Coupe field . . . This field straddles the Alberta-British Columbia boundary with the greater portion of the field lying on the Alberta side. It is located approximately 15 miles northeast of Dawson Creek and produces from the Cretaceous Cadotte and Notikewin sands at shallow depths.

Other fields . . . As noted on Fig. 1, many other gas accumulations occur in Northeast British Columbia. However, most of these are one or two-well fields that are still in the discovery state and are awaiting development. How many of these will grow into prolific accumulations is unknown, but the wide geographic distribution of these deposits indicates the great potential of Northeast British Columbia as a major gas-producing area.

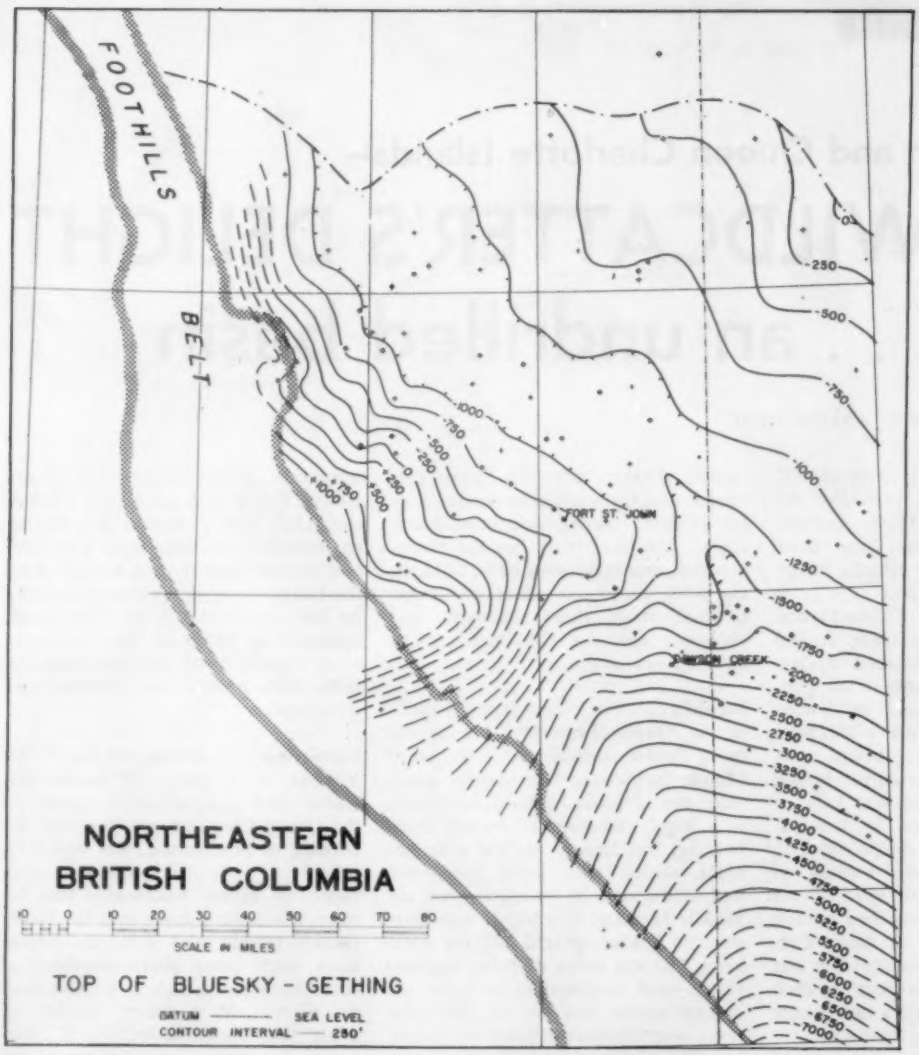
Geologic History and Regional Structure

The area under discussion in this report lies within the northern extension of the Alberta basin. The deposition of Paleozoic sediments was widespread in the Cordilleran though trending north-south through western Canada. Near the close of Mississippian time, there was a period of instability creating local folding and faulting, followed by general emergence and truncation of Paleozoic sediments to the north and east.

Lower Pennsylvanian rocks were deposited in a restricted area in a rapidly submerging sea and under unstable conditions. Mississippian and Devonian beds elsewhere were continually undergoing truncation and erosion to the east and at the close of Paleozoic time, the whole area emerged and was peneplaned by erosion.

Likewise, at the close of Triassic deposition which also occurred in a restricted sea, there was uplift and erosion. Jurassic deposition and erosion followed essentially the same pattern; however, in early Cretaceous time the seas became widespread and deposition covered generally the same area as the Paleozoic.

The Laramide Revolution gave rise to the Rocky Mountains in the western portion of the area and produced all the present-day local structures in the plains area. Fig. 7 illustrates the regional effect of the pronounced upwarping as the foothills belt is approached. This map has been contoured on a regional basis with the consequent removal of the many local



STRUCTURE of the Fort St. John region as drawn on the top of the Bluesky-Gething. Contour interval 250 ft. Datum sea level. Fig. 7.

structures on the west flank of this regional flexure. These younger structures had a tendency to form along the lines of weakness of the older Paleozoic structures.

The tectonics of the mountain building of the Rockies created large thrust faults to the west. These compressional forces tended to foreshorten the earth's crust by wrinkling, overturning, and finally breaking the strata. In the central and southern Rocky Mountains of Alberta this foreshortening was absorbed by overturned folds and large overthrusts. However, in northeastern British Columbia less major faulting has been observed in the mountains and foothills than elsewhere in the Rocky Mountains. Likewise more folding in the strata of the plains area beyond the foothills region in northeastern British Columbia is seen than has yet been discovered in similar areas in Alberta.

It is apparent that the mountain-building force in British Columbia did no produce large thrust faults but rather dissipated itself across the plains area in a series of parallel folds extending many miles in front of the foothills region, gradually decreasing in magnitude and number in an eastward direction. Such anticlines as Kobes, Blueberry, and Fort St. John exhibit more structural relief than those to the north and east such as Buick Creek, Nig Creek, and Milligan.

A hinge line was formed within this portion of the basin during Lower Cretaceous time resulting in an increased rate of depositional thickening to the southwest of the general Fort St. John area. The Rocky Mountain Paleozoic front lies some 50 to 60 miles south and west of this hinge line. This has resulted in the preservation of an extremely thick sedimentary section. Fig. 7 illustrates the present-day configuration on top of the Paleozoic erosion surface. At the north the Fort Nelson high is inferred. This regional feature separates the Liard basin to the northwest from the general Alberta basin to the southeast.

Acknowledgments

The author acknowledges assistance from G. R. C. Morgan, Pan American Oil Corp., Edmonton, who assisted with the original manuscript and in the preparation of many of the illustrations prior to his employment with Pan American. The author also expresses his gratitude to the partners A. D. Hunt and J. D. Ratcliffe for their suggestions and constructive criticism.

Many thanks are also due to C. J. Horne who drafted all of the illustrations.

Canadian Report

Hecate basin and Queen Charlotte Islands—

WILDCATTER'S DELIGHT . . . an undrilled basin

BY C. WARREN HUNT

QUEEN CHARLOTTE outposts of New England whalers provided the first boom time for Haida Indians and a few white traders who lived in the Queen Charlotte Islands in the early nineteenth century.

The whaling days were fading when in 1872 the first stratigrapher studied ammonites on the surf-washed benches of Skidegate Inlet. Reports of oil seepages, and of geodes and amygdules filled with oil caught the wildcatter's attention and resulted in several wells being drilled in the Mesozoics before and shortly after World War I.

The first well drilled by substantial oil interests was Royalite Oil Co., Ltd. 1 Queen Charlotte, located on nongeological bases and spudded on December 1, 1949. It reached granite beneath a thin veneer of sandy Cretaceous (?) strata, and exploration was stalled 9 years by the poor outlook the well created. Today, a new major drilling effort is being started.

Stratigraphy

Since the oldest rocks exposed in the Charlottes are Triassic in age, it is necessary to investigate Paleozoics in southeastern Alaska or British Columbia to know something of the history of the area during Paleozoic times.

As reported by Burchard and Chapin, the late Paleozoics of southeastern Alaska, including Upper Devonian and Carboniferous strata, consist of dark colored limestones, black cherts, and associated basaltic flows, breccias, and tuffaceous beds. In keeping with the latest ideas on origin of such strata these sediments and volcanics may be considered to be of deep sea origin.

Jurassic . . . The oldest exposed rocks in the Queen Charlottes are uppermost Triassic limestones of the basal Maude formation. The Maude, spanning the Triassic-Jurassic boundary, is a highly bituminous, locally coal-bearing, but largely marine series of black shales, with some limestones and sandstones. Its youngest beds are Middle Jurassic. It is highly fossiliferous and grades upward into the overlying Yakoun series of tuffs, agglomerates, and sandstones. It is an excellent source bed for oil and contains some potential reservoir strata. Locally it is metamorphosed by contact metamorphism from dikes, sills, and small plutons. It is probably the source of all the oil seepages on Graham Island. The thickness of the Maude as given by MacKenzie is "at least 3,800 ft."

Conformably overlying the Maude is a thick and variable sequence of tuffs, agglomerates, tuffaceous shales and sandstones known as the Yakoun formation. The volcanics are of explosive origin and subsiliceous lithology. They were deposited in a marine environment and interfinger with normal marine clastics. MacKenzie gives the thickness of the Yakoun as being no less than 3,500 ft. and, in places, approaching 5,000 ft. The formation is, of course, highly variable laterally, both with respect to thickness and lithofacies.

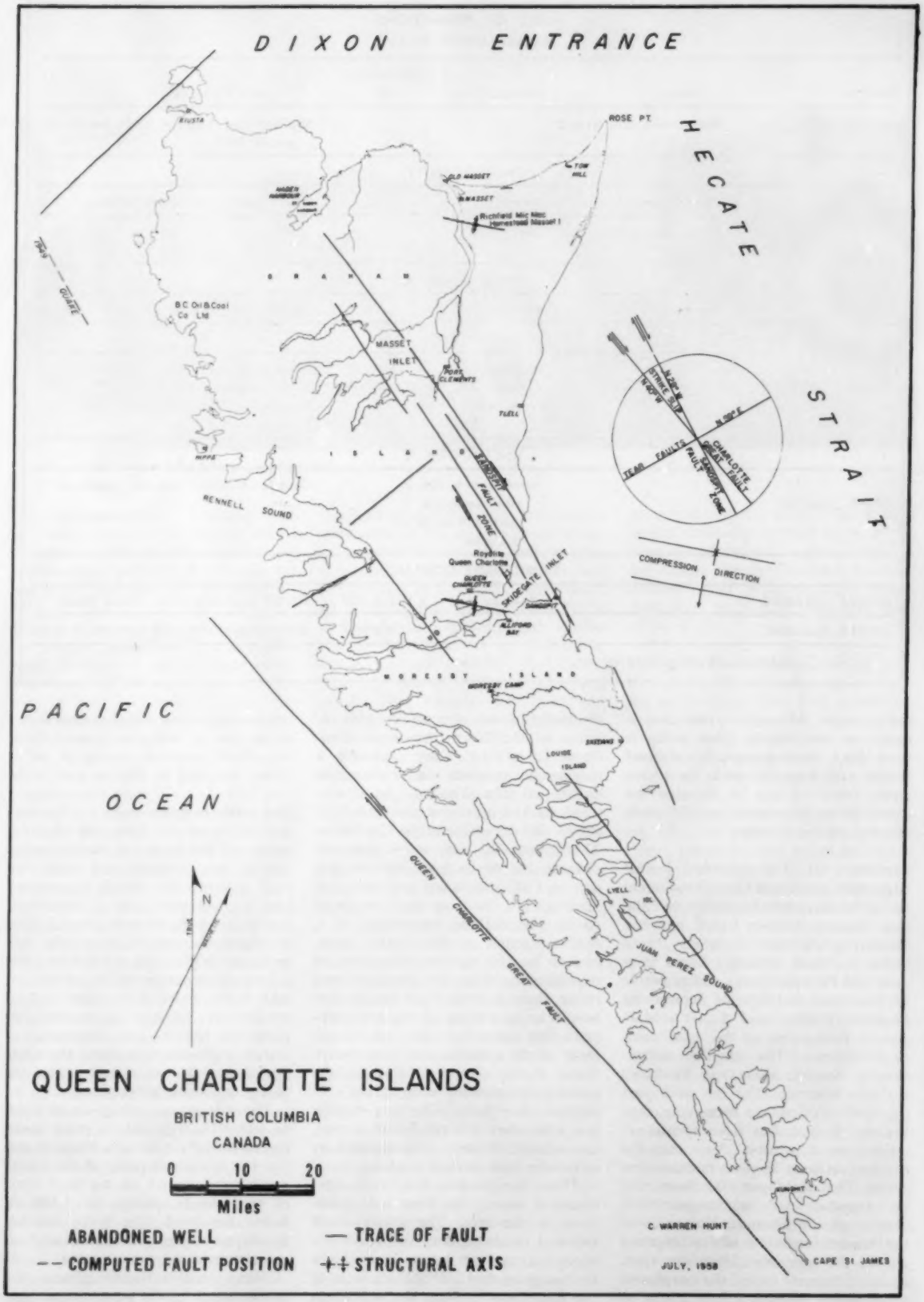
Cretaceous . . . Resting on top of the Yakoun is a group of sandstones, shales, and conglomerates known as the Queen Charlotte group which, according to MacKenzie, was deposited on a highly irregular erosional topography of earlier sediments. This sequence is broken down into the Haida (basal), Honna, and Skidegate formations, each being about one-third of total thickness, which is no less than 6,000 ft. and, possibly, double or triple that thickness locally. If MacKenzie's conclusions regarding an unconformity between the Yakoun and Charlotte strata are correct, enormous lateral variation is implied. However, the writer spent a great deal of time looking for this unconformity but was unable to find it in any locality by direct observation.

The Queen Charlotte group, which is mainly believed to be late (but not latest) Cretaceous in age, comprises

Another first report . . .

Here's the first published geologic report on the oil possibilities of the Queen Charlotte Islands, now Canada's newest wildcat theater. Richfield Oil Co., discoverer of the first big oil in Alaska, has recently commenced a six-wildcat oil hunt on the Queen Charlottes. This author, well known as "the geologist on horseback," now writes of his discoveries there.

C. Warren Hunt, exploration consultant, in partnership with D. Bruce McDougall, geophysicist, Calgary, is a graduate of Caltech, and worked for Standard Oil Co. of California and Intex before entering the consulting field in 1948. For the past 7 years, he has been chief geologist and vice president in the Canadian Homestead group of companies.



FAULT MAP of the Queen Charlotte Islands reveals major fault patterns not unlike those of California coastal region. Fig. 1.

TABLE OF FORMATIONS
Graham Island, B. C.*

PERIOD	EPOCH	FORMATION	THICKNESS (FT.)	DESCRIPTION
QUATERNARY	Pleistocene and Recent		.....	Boulder clay, boulder beds, beach deposits, etc.
		UNCONFORMITY		
TERTIARY	Pliocene-Miocene	Massett	....	Basalt flows and agglomerates
	Pliocene-Miocene	Skonun	....	Sandstone, shale and conglomerate with lignite, in part unconsolidated
		UNCONFORMITY		
	Eocene?	Etheline	....	Dacite and Andesite dikes and sills
		INTRUSIVE CONTACT		
UPPER CRETACEOUS		Skidegate	6,000+	Sandstone and shale conglomerate and sandstone
		Honna	.....	
		Haida	.....	Sandstone and shale; contains coal horizons
		UNCONFORMITY		
UPPER JURASSIC		Kano quartz diorite, Langara quartz diorite, diabase	....	Quartz diorite, syenite, diabase, etc.
		INTRUSIVE CONTACT		
MIDDLE JURASSIC		Yakoun	3,500-5,000+	Basalt agglomerates, minor flows
LOWER JURASSIC		Maude	3,800+	Banded argillites and tuffaceous rocks

*G.S.C. Memoir 88 "Graham Island," J. D. Mackenzie.

the youngest Mesozoic strata in evidence on the islands. This group is very thick and potentially a good source and reservoir rock for petroleum. Some oil can be detected between the grains even where the sands outcrop on the beaches.

Tertiary . . . The upturned eroded edges of Jurassic and Cretaceous strata are overlain unconformably by the late Tertiary Masset basalt and the Skonun sands and claystones. These strata are most certainly latest Miocene and Pliocene in age and resemble in lithofacies and type of deposit the Pliocene Wildcat and Santa Marguerita formations of the west coast of California. The angular unconformity beneath these late Tertiaries is easily observed. For the most part the observable Masset formation overlies the Skonun; but from special relationships it is most likely that the two are, at least in part, contemporaneous. That is, Masset lava flows may be expected to intertongue with clastics of the Skonun. Volcanics of the Masset formation where observed are of the quiescent Hawaiian type, quite different from the explosive Strombolian Yakoun.

The broad setting of the Queen Charlotte Islands structurally with relation to the North American Continent is striking. They represent a maximum position in continental growth, an arcuate salient convex seaward, backed up to the northeast by a subparallel curvature of the Cordillera. The Queen Charlotte arc is the only obvious arc of its type between the convex California coast and the great Aleutian arc. Such an arc is believed to be the surface expression of a major fracture of the earth's crust, and to be the surface expression of overthrusting from the northeast and strike slippage with right lateral motion. The seismicity of the area supports this contention although the activity of the area has not been exceptional during recorded time. On the surface and possibly even in the subsurface, the Queen Charlotte Islands are, like other western North American coastal terranes, characterized by strike-slip and normal faulting.

There is no known low angle overthrusting among the observable structures in the area. The crustal fault referred to above does not reach the surface as a fault but is in evidence by the great depth of the sea west of the Charlottes and by the vulcanism of the land area. The volcanic vents, presumably, occur where crustal weaknesses due to the great crustal faulting allow intrusive stoping or other action resulting in plutons and vents.

The western mountains . . . Turning for the moment from the broader picture of the islands in their relationship to the continent and ocean, we may examine the islands themselves. The highest parts are a band primarily along the western margin. This mountainous area is principally volcanic in origin and represents quite a long recurrent period of vulcanism, with flows which date from Triassic to Pliocene in age. A number of probable craters and remnants of craters were observed along the western shores. In some cases they are partly destroyed by erosion.

The volcanic mountains are as much as 4,000 ft. high and, in most cases, rise directly from the sea. Their slopes, but for the interruption of the wave-cut benches found on the west coast of the islands, plunge to 5,500 ft. below sea level. The wave benches developed along the shores are not more than a mile or so wide.

Many small subacidic plutons are to be found in the western and central parts of the islands and have

ERODED VOLCANOES in the western part of the Queen Charlottes. Fig. 2.

been related to faults, many of them to fault intersections. Some clastic sediments occur in the western and northwestern parts of the islands but are highly intruded and disturbed.

Central slope . . . The central part of the island group has a topographic slope to the east and contains many exposures of Mesozoic strata. This area is highly complex, largely due to the interaction of many large strike-slip, normal, and very high-angle reverse faults.

Northeastern plain . . . A third geologic and geomorphic part of the island is the northeastern flat part of Graham Island, an area of some 700 sq. miles. It is both geologically and geographically quite distinct from other parts of the island. A few incised, youthful creeks are to be found draining this flat surface. But most of the area is strewn with sand dunes (although heavily forested), muskegs, and small mesas of lava. The flat country between the mesas seems to represent a raised wave-cut bench and the mesas themselves, although seeming to be the top of the last Masset flow, may also be an older bench cut along bedding lines. The wide shallow shelf eastward from the northern part of the island bears out the existence of this type of wave-controlled surface.

Faulting . . . Air reconnaissance of the break between the northeastern lowlands and the central part of the island with exposed Mesozoics shows with considerable forcefulness a defined geomorphic break characteristic of the strike-slip faulting of the San Andreas type. Of course, the obvious movement is the small amount of recent vertical movement. However, the straightness of the fault traces and relationship to folds and other faults of the area indicate this fault to be a right lateral strike-slip fault similar to the San Andreas of California. Some workers consider the Queen Charlotte faulting to be an extension of the San Andreas rift itself and postulate a movement in the neighborhood of 150 to 200 miles.

The fault zone dividing the northeastern lowlands from the central part of the islands seems to have several different planes of movement and a width of several miles. Several of the planes of movement pass through the town of Sandspit; and the fault zone is, therefore, referred to as the Sandspit fault zone.

In some places where vertical movement is in evidence triangular hill facets may be seen in spite of the great trees and rapid erosion characteristics of the rain forest. It seems evident that the latest vertical movement must be no older than late Pleistocene to be obvious under these difficulties.

In addition to the triangular facets there are a number of ponds which may be considered sag ponds along this trend. It is quite likely that no other geologist has attached much significance to this fault, if any has recognized it. There is no evidence in the literature of its recognition.

It appears that the two most prominent trends of faulting and the probable axial direction for any compressional folds is more or less as shown on the circular diagram on the map accompanying this report, that is, right lateral strike-slip faulting at N 28° W, transverse-tensional faults at N 59° E, the Great Queen Charlotte fault of unknown but probable right lateral strike-slip at N 40½° W, and folds at N 80° W.

Dating the diastrophism . . . The question now arises as to the age of folding and faulting. This is of paramount importance. In the first place, there is no evidence available with respect to Paleozoic structure although some evidence in southern Alaska might be used.

In earliest Mesozoic time the process of continental accretion in the Queen Charlotte area began by means of a grand fracture of the crust and made itself evident by the venting of large quantities of subacidic, volcanic material. It is possible that some early acidic, plutonic activity on the mainland east of Hecate Strait occurred at the same time and that the commencement of the sinking of the Hecate Strait basin also started at this time.

The existence of Mesozoic Queen Charlotte banks and islands is supported by the lithologic nature of the sediments and volcanics. That is, Jurassic coals indicate temporary emergence; the volcanics are lacking in bedded cherts and are locally highly vesicular; the near-surface intrusives of Mesozoic age are of a type characteristic of continental margin orogenic belts. There is considerable reason to think that the very occurrence of volcanics indicates vents established by major crustal faulting. These conclusions fit nicely with the theory of

GREAT TREES and dense forest are found in the central part of the islands. Here, a view of the rain forest. Fig. 3.

continental accretion as proposed by Wilson. Also the date involved happens to coincide with the earliest definitely established orogeny of the Cordillera.

If these early beginnings are tenable, it is probable that the Sandspit zone of faulting also began at this time. Possibly it commenced as a long, synclinal wrinkle on the back of the rising crustal hinge, thus developing the weakness which later allowed it to be the site of strike-slip and tear fault adjustment and plutonic intrusion. If these actions actually existed as early as the Triassic, the deposition of thick deposits in the Hecate Strait downwarp would have had simultaneous beginnings.

Intermittent volcanic activity and upward hinging of the islands continued throughout the Mesozoic until the end of the depositional period of the Queen Charlotte series. It is uncertain whether latest Cretaceous clastics of Montana (and later) age were deposited at all upon western Graham Island and Moresby Island. They may have been deposited and then stripped off. Or it may be that the upward movement was sufficient to raise the area above sea level and that no late Cretaceous rocks were deposited there. It is possible, in any case, that such deposits were laid on northeastern Graham Island, whether or not they ever lay on the western part.

Some time in the Lower Tertiary, igneous activity resumed in the form of plugs of acidic and subacidic material. These plugs intruded, metamorphosed, and replaced any earlier sediments which offered sufficiently little resistance to their stoping action. Such resistance was at a minimum in the highly brecciated fault zones. The crystalline structure of the intrusives makes it seem likely that a considerable overburden of deposits later than those presently exposed on Skidegate Inlet overlay the entire region, and thus, that the intrusion **preceded** most of the uplift and stripping of western Graham and Moresby Islands of later Mesozoics. As with late Cretaceous sediments, it is possible that, beneath the northeast part of Graham Island, there will be found quite a series of Lower and Middle Tertiary marine clastic deposits which are not anywhere exposed.

By lower Pliocene time considerable erosion had definitely taken place and renewed volcanic activity occurred. The vents for the Pliocene extrusives, so far as can be seen, occurred also along the west coast of the Queen Charlotte Islands, and, in some cases, beyond what is now the west coast. These lavas were not extruded in any great thickness and are of a generally basaltic nature. They correlate approximately with the Columbia River basalts and are of probable Pliocene age. Since their extrusion fault activity on the Sandspit zone has raised Graham and Moresby Islands substantially above their position at the time of extrusion and has allowed erosion by the sea and glaciers to dissect the Pliocene cones very deeply and, in many places, to expose the older rocks which underlie them.

As was mentioned under stratigraphy, there is no reason to think that the Queen Charlotte Islands have ever been higher as a whole than they presently are. It is possible that individual cones built up higher but this seems unlikely during Mesozoic, early Cenozoic, or even later Cenozoic time. It is of some interest to note that, when white men first visited the islands, no large mammals were found. White men, we are told, imported small deer, black bear, and raccoon. The absence of a form such as the grizzly bear is noteworthy. These creatures roamed the entire northwestern American Continent and adjoining Siberia and locally developed into varieties such as the Kodiac bear, Alaska brown bear, Polar bear, etc. Inasmuch as the Queen Charlotte Islands were never during Tertiary times connected with the mainland, so far as can be determined, these bears and associated megafauna could not reach the islands. Thus we have a certain proof that the islands have emerged from the sea and that, in all probability this occurred rather recently, probably about late Pliocene or Pleistocene time.

Recent activity . . . The seismicity and geomorphology of the islands indicate that they are still rising. Hodgson and Milne, referring to the October 22, 1949, earthquake in the Queen Charlotte Islands, give a calculated first motion strike of N 29° W and a right lateral motion with the continent tending to thrust itself over the ocean basin.

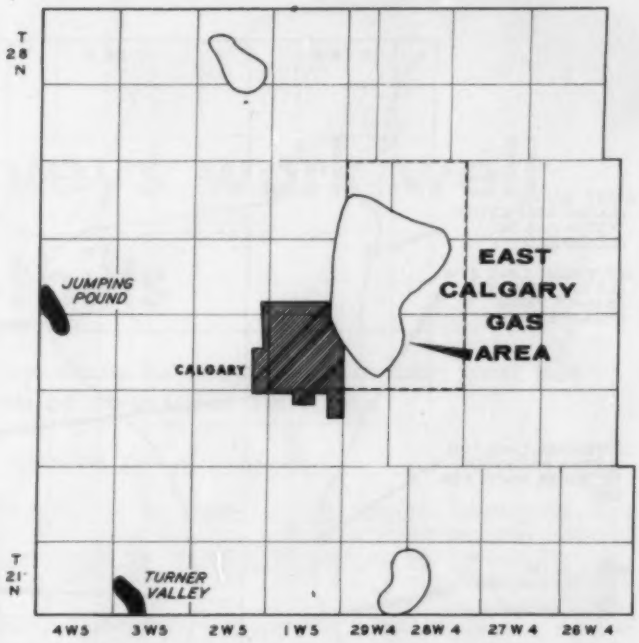
It is apparent from the position of the epicenter of this earthquake, which is on the northwest Pacific front of Graham Island, that the Sandspit zone is but a related lesser expression of the grand right-lateral shear tendency of the area. Even so it is a great fault by oil geology standards and may well have miles of both horizontal and vertical movement. The antiquity of the Sandspit fault zone is of great importance in that it implies the likelihood of a Tertiary and latest Cretaceous sedimentary basin, as indicated also by lithologic evidence.

There is considerable similarity of situation between the supposed Hecate Strait basin and the great basin of California in that they both have a Lower Cretaceous batholith on the east, a deep basin in the middle, and a folded terrane of basinal deposits adjoining a great strike-slip fault to the west. Furthermore, they even have a volcanic terrane beyond the fault to the west; and the volcanic terrane in both cases involves Jurassic and Cretaceous strata. In fact, northeastern Graham Island may be compared in many ways to the Maricopa-Midway-Sunset oil-field district. It would be interesting to find productive similarity.

Four-section spacing marks a progressive step by Conservation Board

East Calgary pattern now calls for one Crossfield well on 2,560 acres

BY NORMAN S. MORRISEY
Drilling-Development Editor



THE FIELD lies on the outskirts of Calgary and harbors a major gas reserve as well as substantial reserves of sulfur.

UNUSUAL RESERVOIR conditions convinced both operators and the Alberta Oil and Gas Conservation Board that 4-section gas spacing is needed to exploit the Crossfield reservoir in East Calgary gas field. The pattern, in effect until July 1, 1961, will enable the operators to delineate the huge reservoir that already covers 50 sq. miles. The high hydrogen sulfide content of the gas plus the size of the reservoir were compelling factors that forced the changeover from normal 640-acre gas spacing.

Successful adoption of 4-section spacing at East Calgary is a significant step forward in conservation. Cooperation and progressive thinking on the part of the operators, the royalty owners, and the Alberta Oil and Gas Conservation Board have provided the necessary incentive for rapidly exploiting a large gas reserve. This sets a precedent and undoubtedly will give impetus to the exploration for gas in other parts of Canada. At best, gas exploration, as well as the quest for oil, is a risk venture, even after the successful completion of the discovery well. In the Calgary area, where operators are attempting to block out large reserves, 4-section spacing will reduce the cost of the initial phase of the development program materially.

Why 4-section spacing? . . . Operators at East Calgary were faced with several unusual problems. A corrosive and dangerous gas that is expensive to handle and process. Expensive wells. A reservoir of unknown, but apparently large areal extent.

The 4-section spacing allows for a systematic exploitation and eventual delineation of the reservoir. It also allows for further experimentation so that operators can determine the optimum completion technique on these wells. The 4-section spacing order is in effect for 3 years and should give operators ample time to evaluate the general reservoir performance. Operators anticipate field-wide unitization by 1961 to effect optimum production procedure.

On normal 1-section spacing, the royalty owners as well as the operating companies might not participate equitably in the output from the field. The 4-section pattern gives all concerned a share in the production surrounding each well and insures them an income during the initial drilling program that will define the reservoir limits. Then, too, the local handling facilities for sulfur are limited to the initial plant-processing capacity. Present known reserves are on the order of 11 million tons and the proposed plant will only produce 100,000 tons per year.

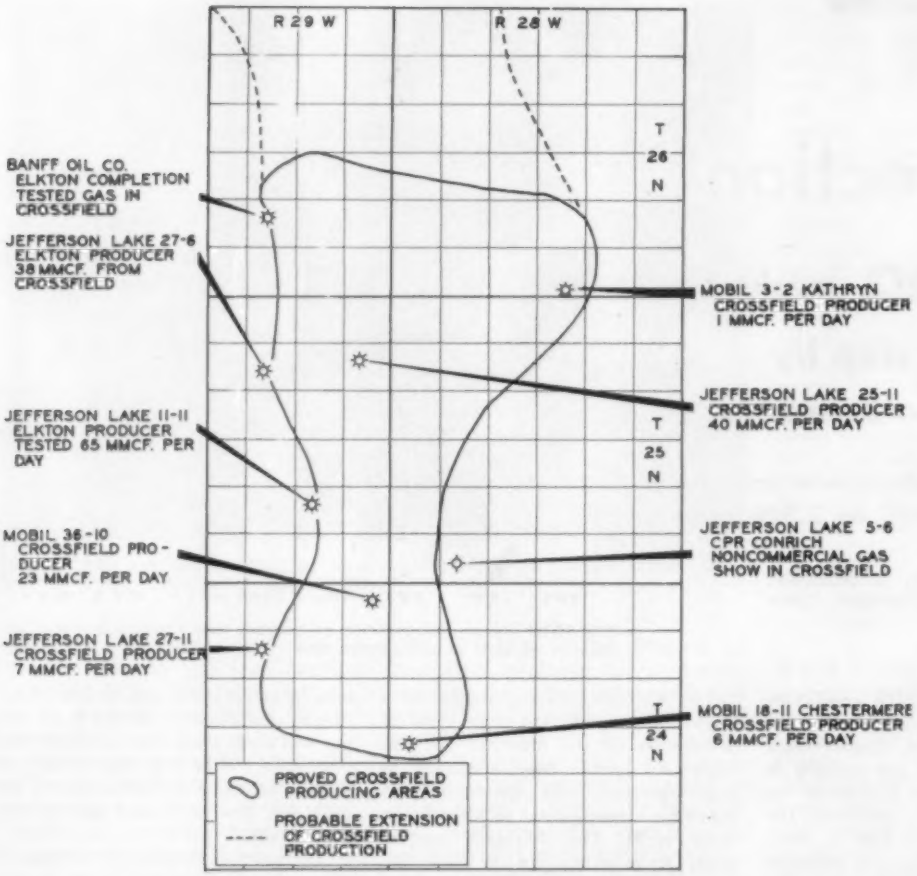
The gas . . . The Crossfield (Devonian) gas has a sulfur content that yields 12 long tons per M.M.c.f. The H_2S content is 35% by volume, and the gas also contains 10% CO_2; the remainder is methane and ethane.

Jefferson Lake Petrochemicals of Canada, Ltd., plans to build a plant to process the gas and to recover the sulfur, distillates, and commercial pipeline gas. Original plans called for a plant that will produce 300 long tons of sulfur daily and 50,000 M.c.f. of gas. Only 10-12 M.M.c.f. of this gas will come from the Crossfield; the remainder will be from the Elkton and Basal Blairmore. Construction of the plant will cost between 8 and 10 million dollars.

The gas will be taken by Westcoast Transmission Co., Ltd., and at the time of the contract, the price was the highest ever paid for gas in Alberta. Jefferson Lake would deliver gas to Westcoast at 14 cents per M.c.f. initially and the contract has an escalator clause that jumps the price ½ cent per M.c.f. annually for the second and third years, and ¼ cent per M.c.f. annually thereafter.

The reservoir . . . Wells drilled to date into the Crossfield have outlined a reservoir that could cover eventually at least 80,000 acres; at least 80 sections are considered proved or semi-proved. The Calgary Crossfield reservoir is a strat trap 13 miles long in a north-south direction and 8 miles wide from west to east. The pay zone is found at an average drilling depth of 8,600 ft. and ranges in gross thickness from 120 to 140 ft. where productive. Engineers with Jefferson Lake estimate that 70 to 90 ft. of the section is not effective pay. Updip the porous pay section grades into a tight nonproductive zone.

Drilling to date has blocked out Crossfield reserves of 6,800,000 long tons of sulfur and 198 billion cubic feet of pipeline gas or 567 billion cubic feet of recoverable raw gas in place.


R 29 W
R 28 W
T 26 N
T 25 N
T 24 N
BANFF OIL CO. ELKTON COMPLETION TESTED GAS IN CROSSFIELD
JEFFERSON LAKE 27-6 ELKTON PRODUCER 38 MMCF. FROM CROSSFIELD
JEFFERSON LAKE 11-11 ELKTON PRODUCER TESTED 65 MMCF. PER DAY
MOBIL 36-10 CROSSFIELD PRODUCER 23 MMCF. PER DAY
JEFFERSON LAKE 27-11 CROSSFIELD PRODUCER 7 MMCF. PER DAY
MOBIL 3-2 KATHRYN CROSSFIELD PRODUCER 1 MMCF. PER DAY
JEFFERSON LAKE 25-11 CROSSFIELD PRODUCER 40 MMCF. PER DAY
JEFFERSON LAKE 5-6 CPR CONRICH NONCOMMERCIAL GAS SHOW IN CROSSFIELD
MOBIL 18-11 CHESTERMERE CROSSFIELD PRODUCER 6 MMCF. PER DAY
PROVED CROSSFIELD PRODUCING AREAS
PROBABLE EXTENSION OF CROSSFIELD PRODUCTION

BECAUSE of the hydrogen sulfide and carbon dioxide content, only about one-third of the recoverable raw gas reserves will reach the pipeline.

Thus far nine wells have tapped the Crossfield. One of these was noncommercial, Jefferson Lake 5-6 CPR Conrich. The pay zone was tight and the well was plugged. The eight wells to date have a total intitial potential of approximately 160 M.M.c.f. per day and range from a low of 1 M.c.f. to a high of 65 M.c.f. per day. These wells, coupled with the proved undrilled locations, can satisfy the requirements of the processing plant.

Surprisingly enough, only 35% of the reservoir gas is of a disposable nature because of the high H_2S and CO_2 content and the raw gas will be produced primarily for sulfur extraction. A downdip well encountered water in the Crossfield, but it is too early to determine if the reservoir will have a water drive.

Future development . . . Present engineering data indicate that the 4-section spacing pattern would satisfy plant and pipeline requirements during the first 10 years of the life of the field. Once this initial drilling program is completed, it is conceivable that no further drilling would take place for several years. As a matter of fact, engineers consider that initially a large amount of excess producing capacity will be available. Even by the twentieth year only slightly more than double the number of wells will be needed. The operators, of course, favor the 4-section spacing pattern since it will evaluate the reservoir with a minimum number of wells.

Additional pays . . . East Calgary is a multipay field and also produces from the Elkton (Mississippian) and a sand in the lower Cretaceous (basal Blairmore). The Mississippian production, too, is a strat trap, and the gas occurs at the eroded unconformity surface.

Banff Oil Co. recently extended the Elkton producing area 3 miles to the north with the successful completion of a producer, North No. 11-101 (see map). The Elkton trend now covers a north-south distance of 7 miles and 25 to 30 sections undoubtedly are potentially productive. The well also tested 1 M.c.f. from the Crossfield, but operator elected to complete it as an Elkton gas well.

The Elkton, a much smaller reservoir than the Crossfield, produces pipeline gas and reserves are on the order of 4 to 4½ billion cubic feet per section. Already 25-30 sections are potentially productive and the reservoir limits have not been completely defined.

TABLE 1—NATURAL-GAS RESERVE ESTIMATES—CALGARY FIELD—CROSSFIELD MEMBER APRIL, 1958.

Production zone	Crossfield
Average depth—ft.	8,500
Estimated gas gravity (air—1.0)	0.9
Estimated initial reservoir pressure—psia.	3,634
Estimated reservoir temperature—°F.	155
Estimated abandonment pressure—psia.	400
Estimated initial compressibility factor	0.675
Estimated abandonment compressibility factor	0.935
Estimated average connate water content—%	35
Estimated average porosity-feet of pay zone—% ft.	246
Est. original gas in place—M.c.f./acre-porosity-ft.	89.5
Est. recoverable gas in place—M.c.f./acre-porosity-ft.	82.4
Estimated surface losses @ 5%	4.1
Estimated process losses @ 65%	53.5
Est. disposable gas reserves—M.c.f./acre-porosity-ft.	24.8
Est. total possible productive area—acres	80,200
Est. total possible pipeline gas reserves—M.M.c.f.	198,000
Est. total possible recoverable raw gas	567,000

Canadian Report

Refraction surveys work well in Alberta foothills

They stay close to mapping horizon and pin down major structural features

BY JOHN L. ROBINSON, Century Geophysical Corp.

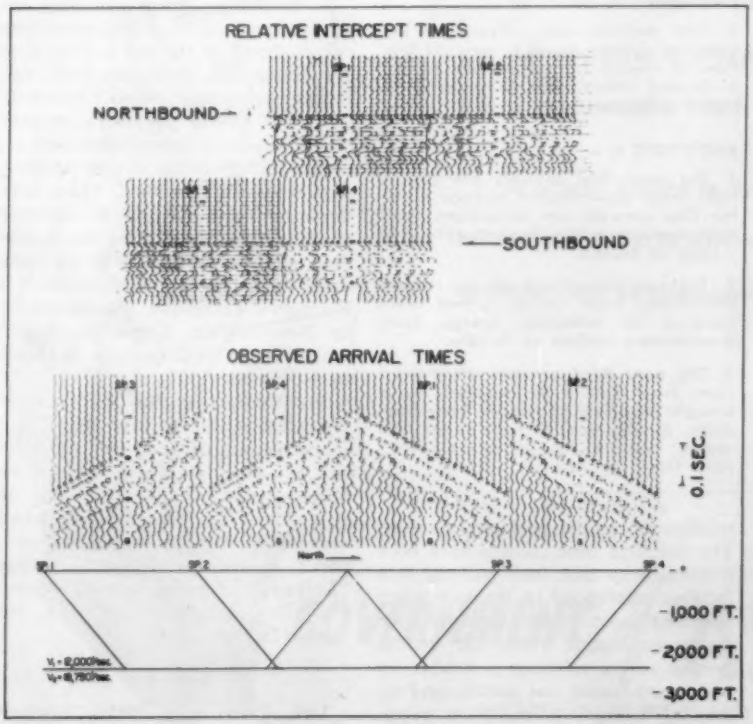
REFRACTION SEISMOGRAPH has been applied profitably to the geologic investigation of the Alberta foothills where major gas strikes have been made in the Mississippian Rundle. Several aspects of Mississippian recommend the refraction method for its structural delineation:

1. It refracts.
2. Its high and fairly constant refracting velocity provides a norm for correlation over wide areas.
3. Structures are large as the published geology of the area indicates.[1]

Thus, it is the particular ability of the refraction technique to stay close to the target as well as to rough out major structural features that recommend it for foothills exploration. Since many Canadian oil men are optimistic about the potentialities of the gas market, a close look at typical refraction problems encountered in foothills geology seems appropriate.

Model studies are particularly helpful in explaining the events seen on the refraction records and can be useful in interpreting the sequence of events. In addition, magnetic recordings enable us to prepare intercept time record sections that are more easily interpreted in terms of geology.

Figs. 1 and 2 show the application of the refraction seismograph to a simplified yet representative model of Mississippian structure in the foothills. Fig. 1 can be regarded as a strike line along which the Mississippian is flat. Fig. 2 is a dip line crossing a major overthrust having a throw of about 800 ft. The seismic record section grouped under the headings "Observed Arrival Times" and "Relative Intercept Time" were prepared from two magnetic recordings processed through our data processing center to yield time values satisfying the requirements of the model.



MODEL shows a simple set of geologic conditions and the refraction line parallels the strike of the beds. Fig. 1.

Velocity control . . . In order to determine the depth and structural relief of the Rundle from refraction measurements, we must know the velocity of the overburden as well as the velocity of the Mississippian. The overburden velocity can be estimated from well-velocity surveys. The refraction velocity along the Mississippian can be measured directly. For purposes of illustration, the Cretaceous overburden has been assigned a velocity of 12,000 ft. per second and the Mississippian 18,750 ft. per second. Both values are in the right order of magnitude.

Once these velocities were assigned, we were able to construct the wave trajectories through the overburden and along the refractor in accordance with Snell's law. The resulting observed arrival times at the surface are shown in Fig. 1 above the geologic cross-section as being recorded on records from shot points 1, 2, 3, and 4.

The next step was to construct the relative intercept times shown on the suite of records at the top of the Fig. 1. The times shown on these records were determined from the formula:

$$I = T - X/Vr$$

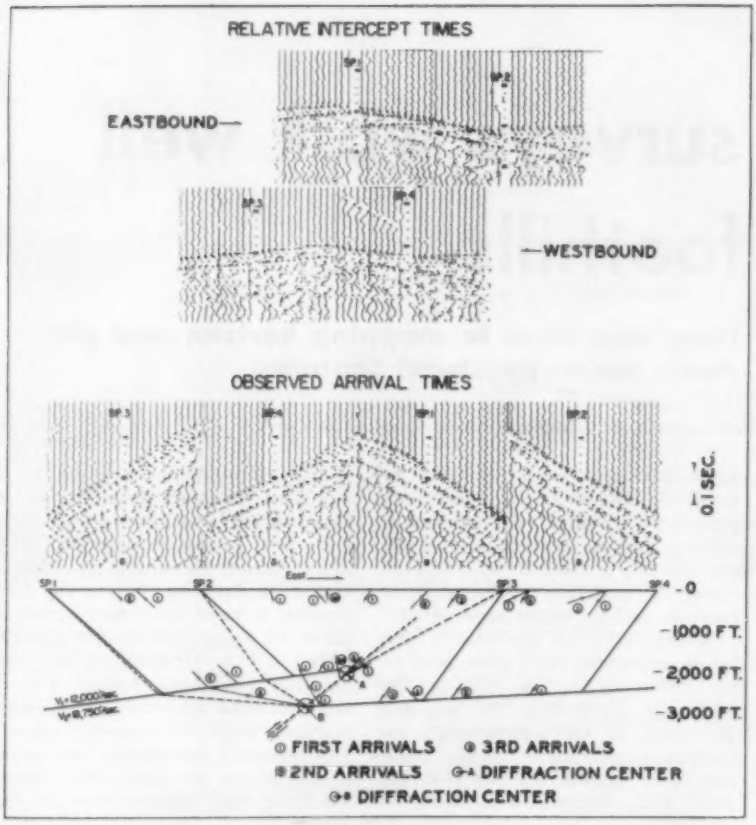


Fig. 2

SHOTPOINT 1—
1. Near first arrivals are refractions from upthrown surface—far arrivals used are diffractions from Center A.
2. Second arrivals are diffractions from Center A initiated by energy traveling along fault face from Center B.
3. Third arrivals are refractions from downthrown surface initiated by energy traveling along refractor from Center B.

SHOTPOINT 2—
1. The near arrivals are diffractions from Center A—the far ones are refractions from downthrown surface initiated by energy starting from Center B.
2. The near second arrivals are refractions from downthrown surface initiated at Center B. The far second arrivals are diffractions from Center A.
3. Third arrivals are diffractions from Center A initiated by energy traveling along fault face from Center B.

SHOTPOINT 3—
1. First arrivals are refractions initiated at Center A via a straight line flow of energy from Shotpoint 3.
2. Second arrivals are refractions initiated at Center B.

SHOTPOINT 4—
1. The near first arrivals are refractions from downthrown surface — the far first arrivals are refractions from downthrown surface through upfaulted wedge of Rundle.
2. The near second arrivals are largely diffractions from Center A that were initiated by refracted energy from downthrown surface of Rundle.
3. The near third arrivals are diffractions from Center A initiated by a straight line flow of energy from Shotpoint 4. The far arrivals from this source become second event refractions from the upthrust surface.

Where:

I = intercept time
T = observed time
X = shot detector distance
Vr = velocity of refractor.

This step in refraction interpretation is analogous to removing the normal moveout on reflection records. The time horizons are now flat as they should be to bear a similar relationship to the geologic structure. The intercept time records have been positioned so that their vertical projections correspond to the subsurface positions from which the refraction waves emanated. Thus, the central portion of the refractor is defined by both northbound and southbound refracting energy, a condition representing "two-way reversed in-line control."

Faulting . . . The terminologies describing Fig. 1 apply to Fig. 2 as well. However, the geology as well as the physics is complicated. The wedge edges of the fault face become diffraction centers, which act as secondary sources of sound energy after being pulsed by the refracted energy arriving at these points. From another point of view, diffraction centers serve to scatter energy rather than to channel it in a predictable direction which is characteristic of refracted energy. These diffraction centers give rise to multiple sets of arrivals and an interested geophysicist can follow out their trajectories with the aid of the legend in Fig. 2 and the description given.

It is well to point out that the vertical projection of intercept time curves shown at the top of Fig. 2 do not correspond accurately with subsurface refracting points. Nevertheless, these curves do give a measure of the structural deformation and are useful for obtaining a first approximation to the structure. These relative curves can be used to construct absolute time curves after the manner described by Mendenhall in his paper entitled "Notes on Refinements in Refraction Technique, and Adaptation to Near-Surface Corrections," presented at the SEG meeting in Dallas, in November 1957.

Some objection may be raised to the fact that arrivals from the 12,000-ft. per second material are not shown in the illustrations. However, our main interest lies in interpreting arrivals from the Mississippian, which are shown to good advantage in a paper by George Blundon, entitled "Refraction Seismograph in Alberta Foothills," Geophysics, v. 123, No. 3, p. 828, July 1956.

THE AUTHOR

John L. Robinson, vice president of Century Geophysical Corp. of Canada, has had experience in geophysical work since 1936. He is a graduate of Carnegie Institute of Technology and a member of the following professional societies: Society Exploration Geophysicists, American Association Petroleum Geologists, Canadian Society Exploration Geophysicists, and Alberta Society Petroleum Geologists.

Reference

Link, Theodore, A. (1954), Interpretations of Foothills Structures, Alberta, Canada: Western Canada Sedimentary Basin, Rutherford Memorial Volume, AAPG, p. 55.

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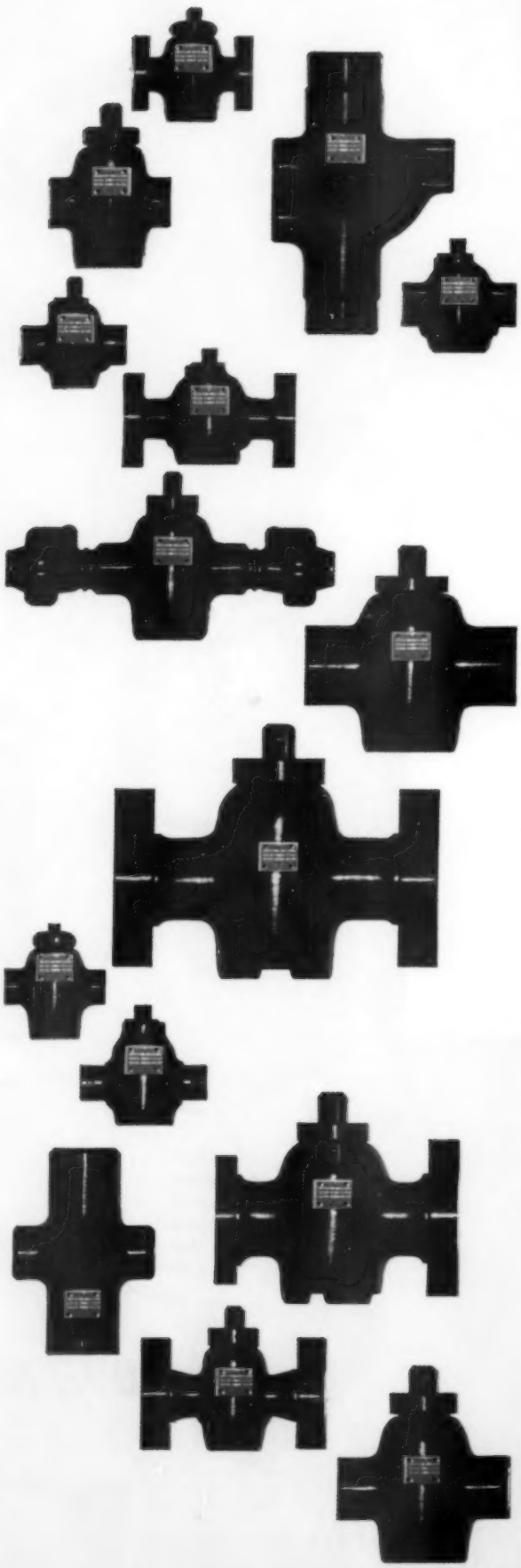

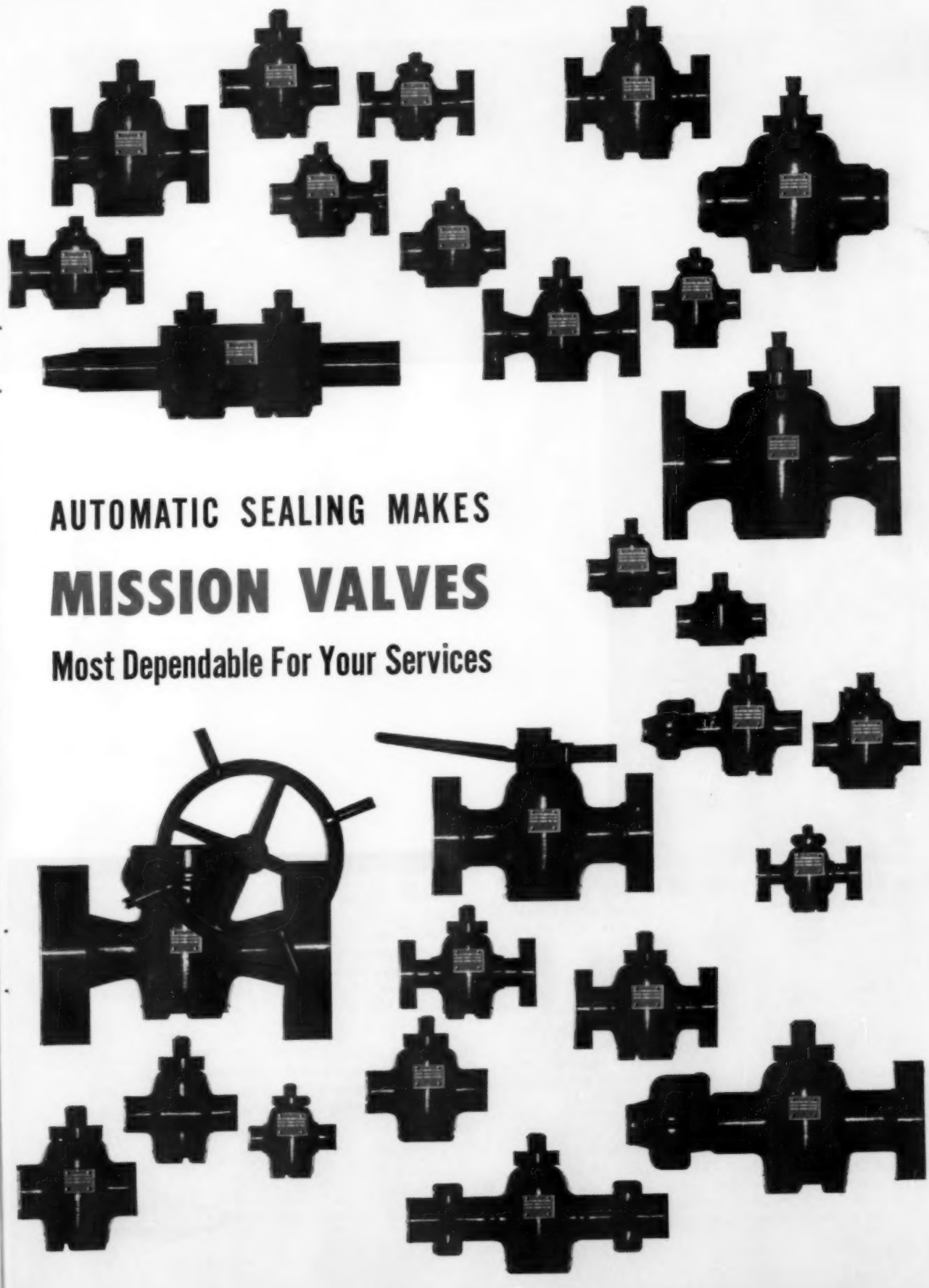

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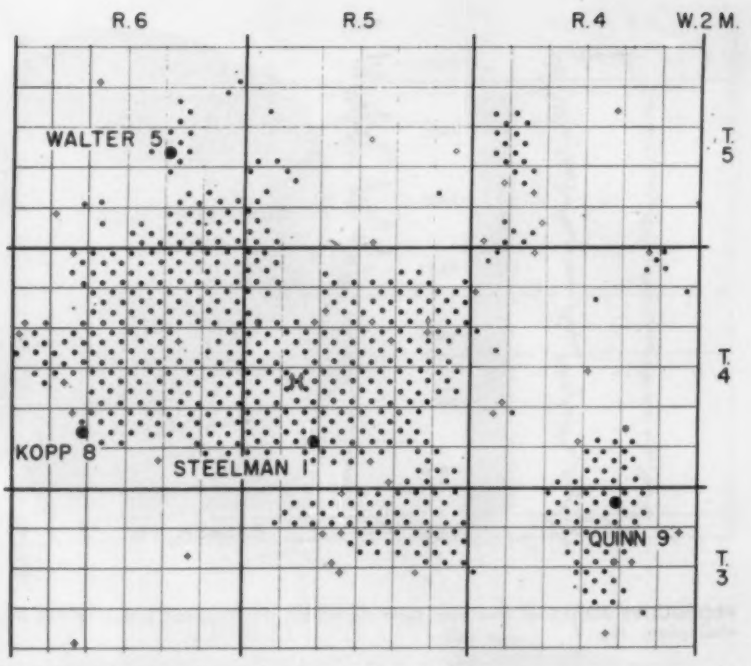
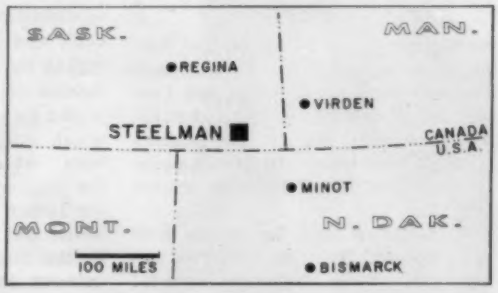
STEELMAN FIELD . . . an 80-million-barrel strat trap in Saskatchewan

The bulk of this oil is in the Midale beds, and estimates are based on primary recovery only. A pilot waterflood project is under consideration.

BY J. NESBITT



STEELMAN FIELD lies in southeastern Saskatchewan. The four discovery wells shown here now broadly outline the field. Fig. 1.



STEELMAN FIELD lies in southeastern Saskatchewan, 50 miles west of the Manitoba border and 20 miles north of North Dakota. Geologically, it is on the north flank of the Williston basin. Most production, which is light-gravity oil (32°-41° API), is from the Midale beds with a minor amount from the underlying Frobisher beds. Both reservoirs are in the Madison group of the Mississippian. The developed area at the end of 1957 was 70 sq. miles with 570 wells drilled on 80-acre spacing. Although development is being carried out in 1958, it is at a reduced rate from that of the years 1956 and 1957.

Steelman is one of a group of fields on a 100-mile-long northwest-southeast trend. All of these have, in common, both the Midale beds as their main producing reservoir and similar trapping conditions. They vary mainly in the local quality of the Midale reservoir and in the quality of their oil, which ranges from 28° to 41° API. Steelman lies centrally along this trend with the Midale and Weyburn fields to the west and Oxbow-Florence field to the east.

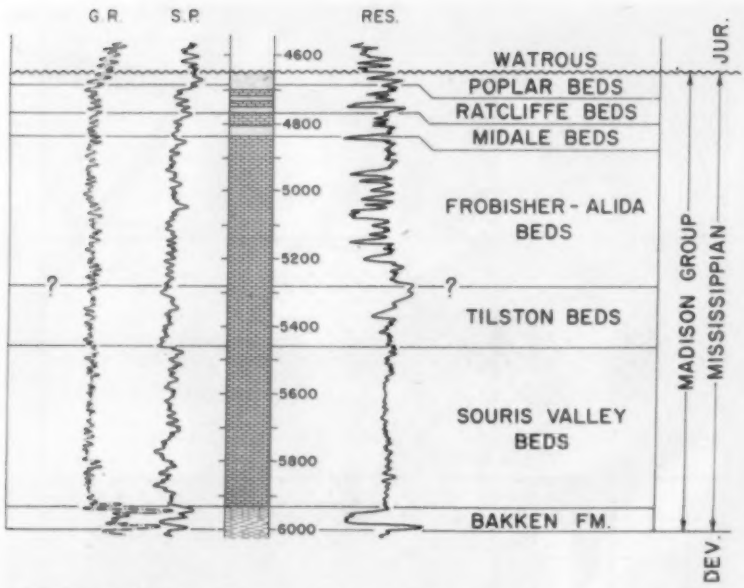
Author is geologist, Regina division, Imperial Oil, Ltd. (producing department). This paper was originally presented at the Second International Williston Basin Symposium, Regina, 1958. It is published with express permission of Imperial Oil, Ltd.

Discovery wells . . . The well which might claim the distinction of discovery is Canadian Gulf-Canadian Devonian 9 Quinn in LSD 9-34-3-4w2 (Fig. 1). This well in Frobisher pool obtained production from Frobisher beds in April 1954. The first follow-up well by this team completed in the Midale reservoir, the main reservoir of Steelman field.

At the end of 1954 the same team of Canadian Gulf Oil Co. and Canadian Devonian Petroleums, Ltd., had completed a discovery well in Lampman pool, 5 Walter, in LSD 5-14-5-6w2. In early 1955 Imperial Oil, Ltd., completed its 1-8-4-5 Steelman well. The Thomas W. Leach Kopp well in LSD 8-8-4-6 was completed by late summer of 1955. These four wells now broadly outline Steelman field.

The discovery wells at Frobisher, Lampman, and Steelman were located on features which were found by comprehensive seismic programs on the part of the two major operators, Canadian Gulf and Imperial. In each case subsequent drilling has shown that the structural features on which the wells were drilled were not important in the trapping of oil in the Midale beds. However, a minor closure on the top of the Frobisher beds in Frobisher pool indicates that structure provided a part of the trap in this reservoir.

The Thomas Leach Kopp well was probably drilled without the advantage of seismic data, and yet it found the thickest pay zone of any of the early wells. The success of these wells in the Midale reservoir resulted from their location on a favorable geological trend. They are immediately downdip from the truncation of a potential reservoir which had previously recorded oil shows and production in this part of the Williston basin.



PRODUCTIVE ZONES at Steelman field lie within the Madison group of the Mississippian. Fig. 2.

Geology

Stratigraphy . . . The Midale and Frobisher-Alida beds have been defined by the Mississippian Names and Correlations Committee of the Saskatchewan Geological Society. The position of these beds within the Mississippian is shown on the stratigraphic section (Fig. 2).

In Steelman field the Midale beds are separated from the Paleozoic unconformity by an alternating sequence of carbonates and anhydrites, the Ratcliffe and Poplar beds. They are underlain by 5 to 10 ft. of earthy, argillaceous dolomite. This thin dolomite marks the top of a series of limestones which comprise the Frobisher-Alida beds. As defined by the committee, the section between the Midale and the Tilston beds includes both the Frobisher and the underlying Alida beds. In the Steelman area the separation between them is not readily recognized. This discussion will be confined to the productive zone which lies at the top of this section and is part of the Frobisher beds.

The term Midale is widely used throughout this part of the Williston basin. The Frobisher, Alida, and Tilston beds are commonly grouped together as the Mission Canyon formation.

At this locale in the Williston basin there are about 9,000 ft. of sediments above the Precambrian basement. Approximately 1,300 ft. of Mississippian sediments immediately underlie the major post-Paleozoic unconformity which occurs in the middle of the sedimentary section. The Mississippian is overlain by 4,600 ft. of Jurassic, Cretaceous, and Pleistocene and underlain by 3,600 ft. of Devonian, Silurian, Ordovician, and Cambrian.

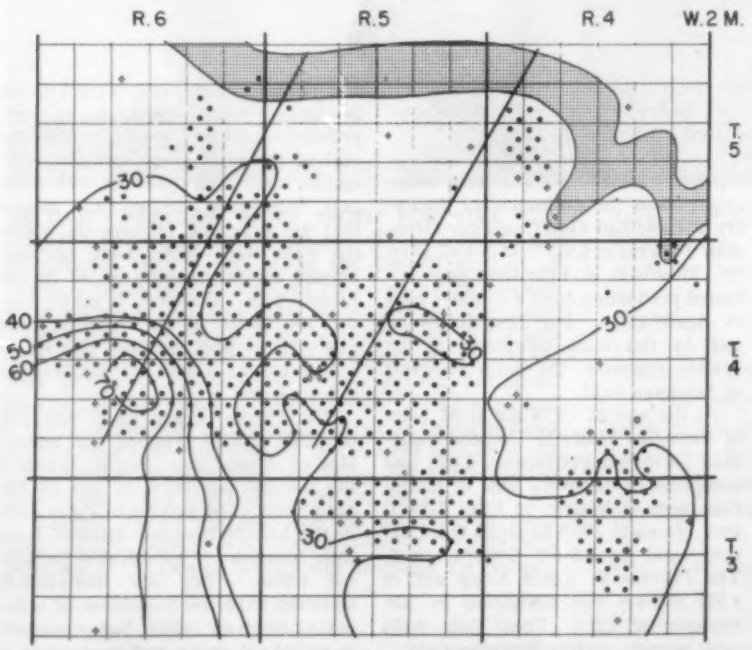
Midale lithology . . . The Midale beds over a large part of Steelman field can be readily divided into an upper carbonate and a lower anhydrite, each about 30 ft. thick. In the southwestern part of the field, basal anhydrite alters facies to a limestone with a slight thickening in the section. The upper carbonate section remains relatively uniform in thickness over the entire area despite the changes in the lower section. The pattern of the facies change is shown by the thickening on the isopach of the total Midale carbonate (Fig. 3). This interval includes both the uniform thickness of the upper carbonate plus the additional thickness of lower carbonate in the southwest corner of the map.

Although the limestone facies of the lower Midale has wide lateral extent southwest of the Steelman area, the line of facies change cuts across only the southwestern corner of the field. Here it forms an algal bank.

The lithology of the Midale beds is shown on two diagrammatic dip cross-sections. The first (Fig. 4) extends updip from the southwestern corner of the field and shows the facies change from limestone to anhydrite. The second (Fig. 8) is through the center of the field and shows the equal thickness of carbonate and anhydrite which is present over most of the area.

Each diagrammatic cross-section is about 12 miles long, while the vertical section is about 200 ft. The actual dip of the beds is approximately ½°.

The first cross-section (Fig. 4), shows the relatively uniform upper Midale carbonate overlain by the anhydrite of the Ratcliffe and underlain by the lower Midale anhydrite. Downdip, this lower Midale anhydrite changes facies to the algal limestone.



TOTAL MIDALE carbonate section at Steelman thickens to the southwest, as revealed in this isopach map. Shaded area is the Midale subcrop. Fig. 3.

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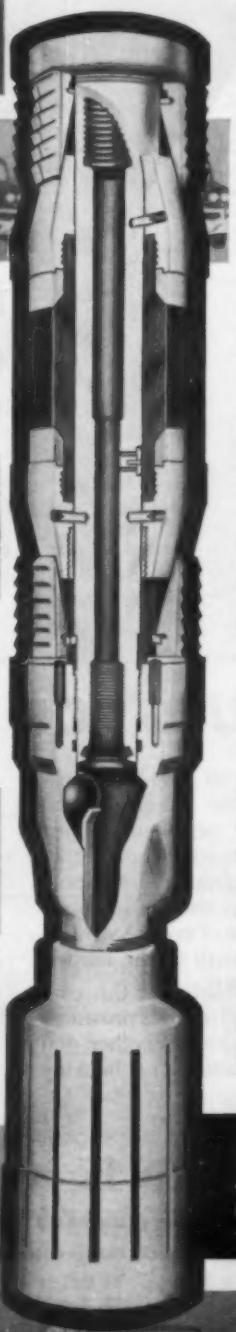

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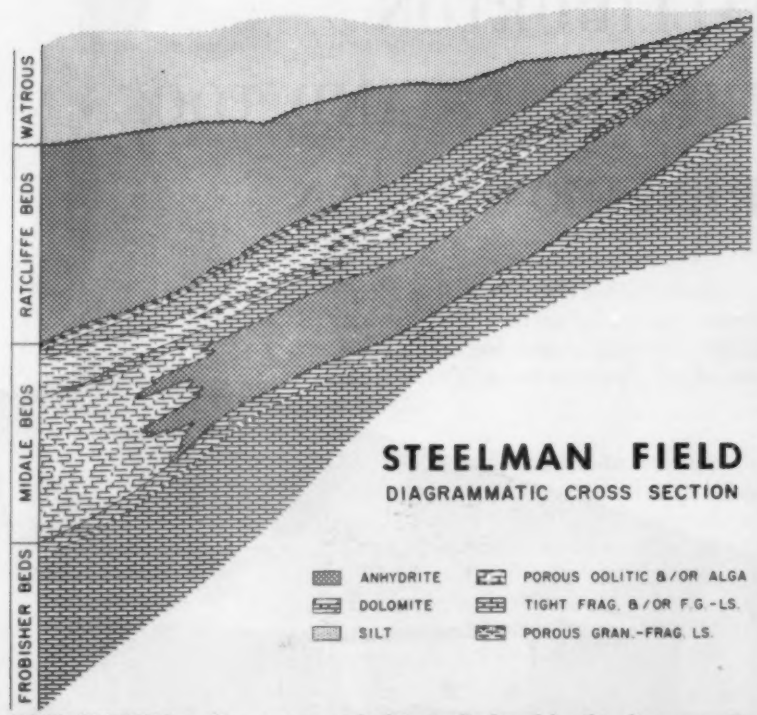
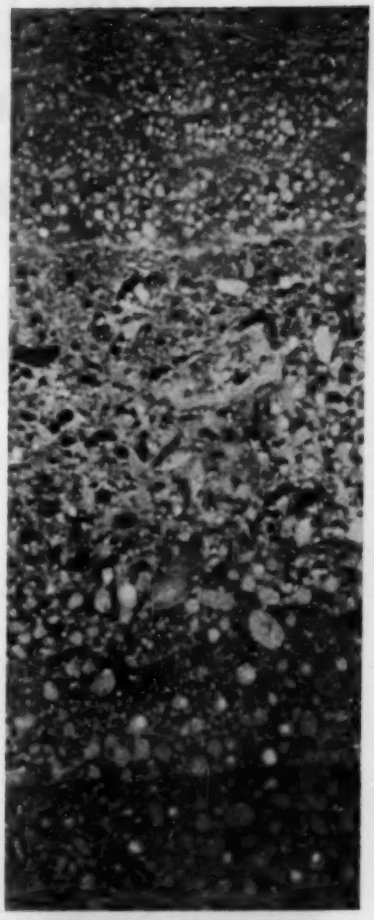


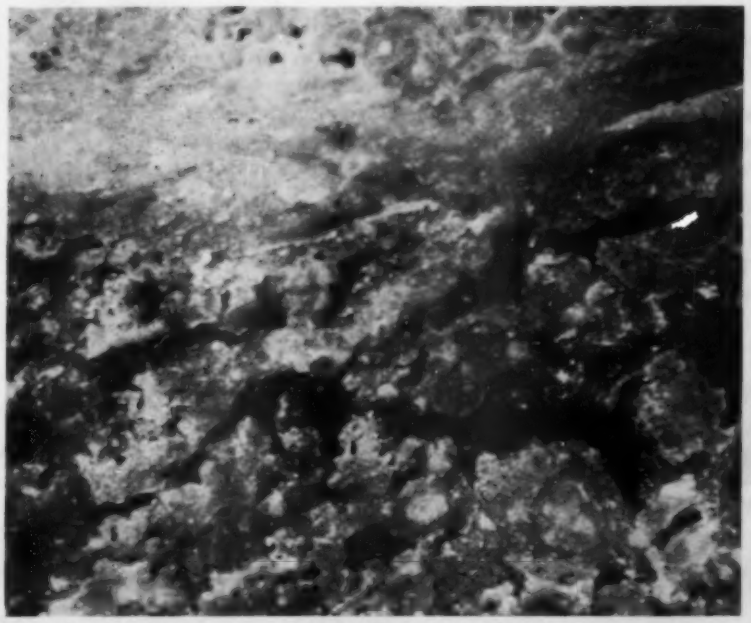
FACIES CHANGE from limestone to anhydrite is displayed by this diagrammatic cross-section updip from the southwestern corner of Steelman field. Fig. 4.

The Midale beds are underlain by the Frobisher with the thin dolomite band at the top of the Frobisher limestones. At the Paleozoic unconformity the Mississippian is overlain by the tight, silty red beds of the Watrous formation. These cover the Midale reservoir at its subcrop.

Fig. 5 is a magnified (X6) example of the porous vuggy algal limestone of the lower Midale. Fig. 6 (X1) is a section of 3-in.-diameter core, showing banded algal, pisolite limestone with poorly developed porosity. The algal limestones of the lower Midale have porosities in the 10 to 15% range and permeability in the order of 20 to 50 md.



PHOTOGRAPH of a 3-in.-diameter core, showing the banded algal, pisolite limestones of the lower Midale in Steelman field (X1). Fig. 6.



POROUS, VUGGY character of the lower Midale algal limestone results in a porosity range of 10-15% and permeabilities of 20-50 md. (Magnification X6). Fig. 5.

The second diagrammatic cross-section (Fig. 7) shows the normal condition for Steelman field with equal thicknesses of upper carbonate and lower anhydrite in the Midale beds.

The upper carbonate section is predominantly a clastic limestone. It contains lenticular beds which are characterized by variations in grain size. The grain size varies from a chalky limestone in the fine range up to only a fine fragmental in the coarse range. Within the individual beds the material is generally well sorted, but some carry relatively coarse organic fragments in a fine well-sorted matrix. Fig. 8 shows typical examples of the two fragmental reservoirs.

Thin section, high content . . . Generally, in the developed area of the field, there is a total of 10 to 20 ft. of fine fragmental reservoir in the 30 ft. of upper Midale carbonate. Some wells exceed 20 ft., but perhaps

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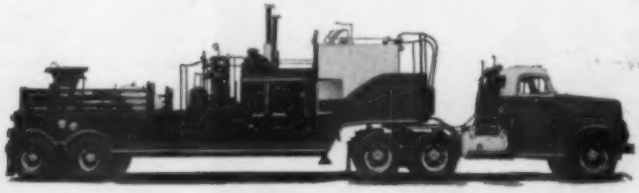

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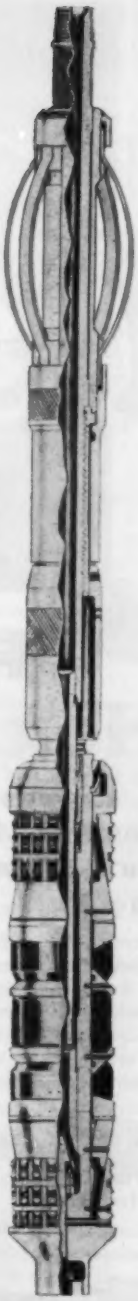

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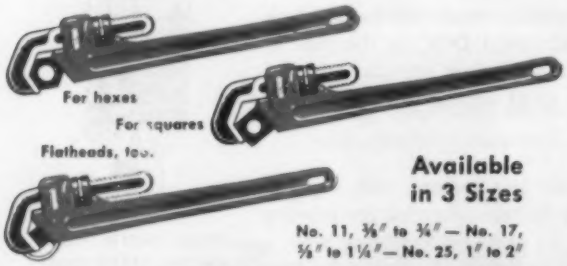

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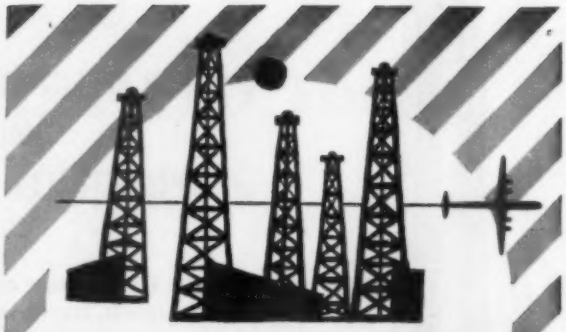

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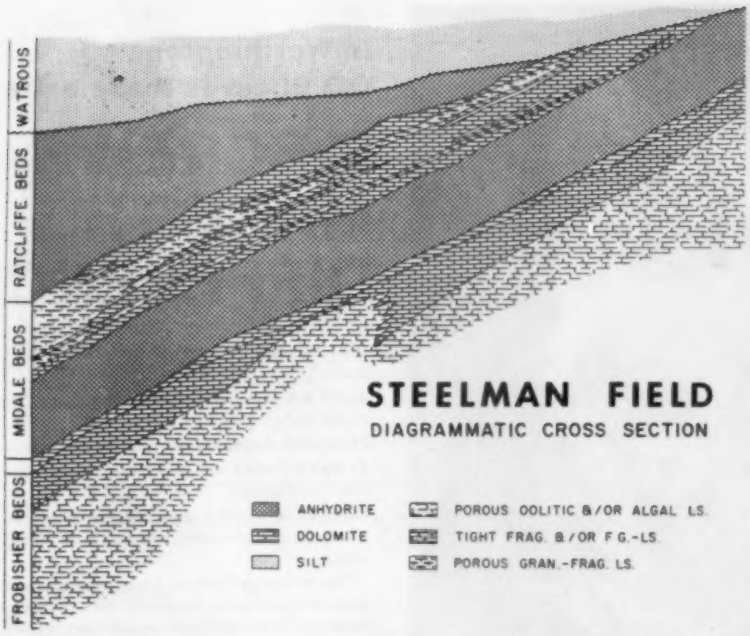
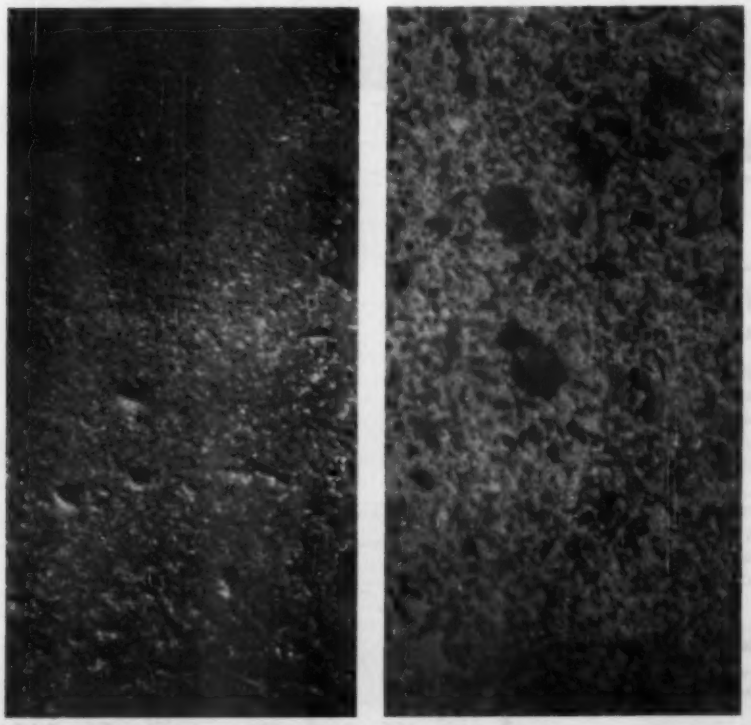


EQUAL THICKNESS of carbonates and anhydrites are found at Steelman in the Midale beds. Fig. 7.

more do not measure up to even 10 ft. However, in the area where the lower section is an algal limestone, rather than anhydrite, the total pay can exceed 60 ft.

Although 10 to 20 ft. is a rather thin pay zone, particularly at a depth of 4,200 to 4,800 ft., the upper Midale reservoir has a redeeming characteristic. The porosity of this limestone is similar to that of a good sand. Much of it falls in the 15 to 20% range and porosities up to 30% are not uncommon. Occasionally 40% porosities have been recorded. As a result the reservoir carries a surprising volume of oil in place despite its lack of thickness. However, its permeability is low and a large proportion of the pay is in the 2 to 10-md. range.



THE UPPER CARBONATE SECTION in Steelman field exhibits variations in grain size. At left (X8) is a typical example of the fine fragmental reservoir rock; at right, (X4) slightly coarser fragmental material, largely lime cemented. Fig. 8.

Trapping mechanism in the Midale . . . The description of the Midale beds has indicated the trapping mechanism (Fig. 7). The thin reservoir is sandwiched between two anhydrite beds which supply the top and bottom seals and the Jurassic red beds prevent escape at the Paleozoic unconformity. Below the lower anhydrite is the thin earthy dolomite band which marks the top of the Frobisher beds. Although this is frequently porous and oil stained and may, in isolated locations, even be capable of limited oil production, it has very low permeability. Since the top of the Frobisher beds is frequently tight, the combination of this and the dolomite forms an imperfect base seal for the lower Midale limestone where the anhydrite is not present.

A structure-contour map on the top of the Midale (Fig. 9) shows the reservoir to be dipping from its subcrop to the southwest at about 60 ft. per mile. Although the updip migration of oil beyond the developed area has been retarded by the general decrease in the reservoir quality in this direction, a positive seal has been provided by the tight red beds of the Watrous formation.

The southern limit of production in the Midale stratigraphic trap is controlled by flank water. The location of the water line is indicated on the structure map by the southern limit of drilling. It has been quite clearly defined and shows a slight variation in elevation. Since no general gas cap is present, the oil column from the subcrop to flank water is more than 600 ft.

The eastern and western limits of production are controlled by a decrease in the quality of the reservoir. This reduction in quality is sufficient to prevent the lateral migration of oil along strike.

Although a gas cap is not present, and although the elevation of flank water is reasonably regular, several anomalous accumulations of both gas and water have been found in the Midale reservoir. Most of these are only two or three 80-acre locations in areal extent. In each case their location is related to structural trends which cross or partially cross the map area in a northeast-southwest direction. Generally these trends are poor-

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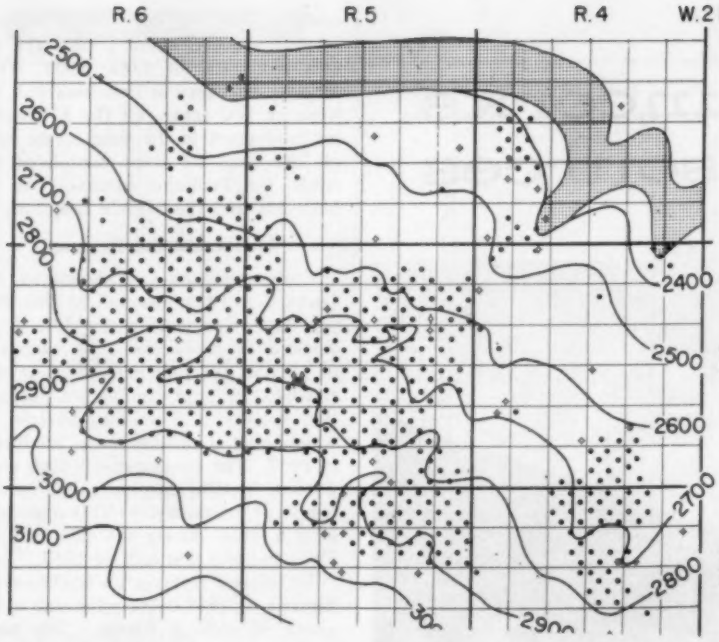
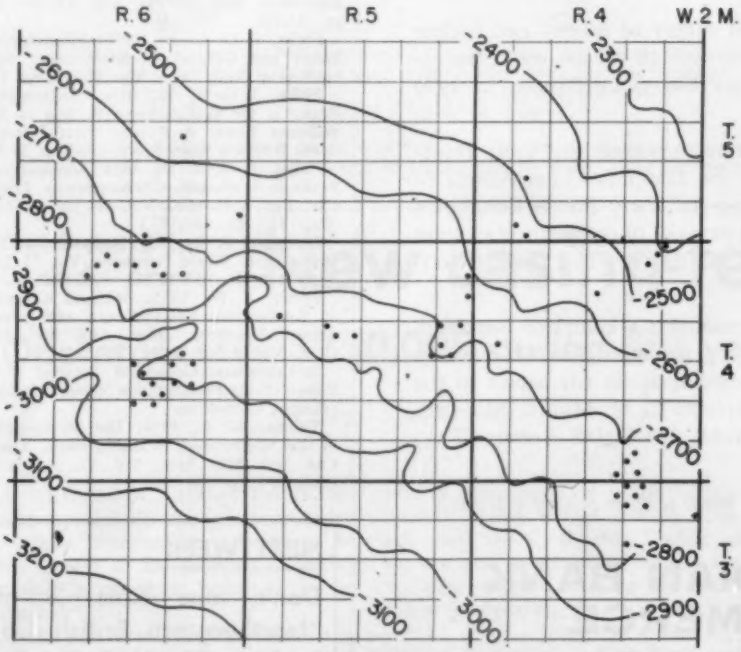


MIDALE RESERVOIR at Steelman dips from its subcrop (shaded) to the southwest at about 60 ft. per mile. Fig. 9.

ly defined but locally they are sharp and well defined.

At locations along some of the high trends, the reservoir has been found gas-bearing. These isolated accumulations (Sec. 27-3-4, Sec. 11-4-4 and Sec. 30-4-5w2) vary widely in elevation. It is assumed that they are localized on the high structural trends and are trapped by sharp updip reductions in the quality of the reservoir.

In three of the sharp and well-defined structural lows (Sec. 3-4-5, Sec. 22-4-5 and Sec. 23-4-6w2) the Midale reservoir is water-bearing. This is most anomalous when wells both updip and downdip, even along the same low trend, are normal oil producers and particularly when the water-bearing reservoir is as much as 300 ft. structurally higher than the elevation of flank water. As in the case of the local gas caps, these are believed to be related to local variations in the quality of the reservoir. It seems probable that the downdip flushing of water by the migration of oil has been partially prevented by impermeable blocks in the reservoir along these particular lows.



CONTOURS on the Frobisher beds at Midale reveal poor to well-defined structural trends the same as those in the Midale. Only Frobisher wells are spotted. Fig. 10.

Lithology of the Frobisher-Alida beds . . . Data on the second and less-important reservoir in Steelman field, the Frobisher beds, is rather meager in comparison to that on the Midale. They are fragmental, oolitic, and algal limestones. These are overlain by the thin dolomite which separates them from the Midale beds. A variable thickness of the upper portion of the limestone section is tight. In some areas of the field this thickness exceeds 100 ft. but locally is less than 5 ft. The irregularity in the top of porosity in this generally porous reservoir can be attributed to a variety of factors. Locally the porosity is anhydrite infilled or lime cemented. Frequently the fragments or oolites are carried in a tight chalky to argillaceous limestone. The combination of these factors results in an irregular porosity development at the top of the reservoir.

Trapping mechanism in the Frobisher . . . The same poor to well-defined structural trends which were apparent on the Midale are present on the Frobisher beds structure map (Fig. 10). Only wells producing from the Frobisher are indicated on this map. The minor accumulations in this reservoir are located on the high trends but not necessarily on local closures. The irregular tight cap at the top of the limestone forms not only a top seal to the reservoir, but by its irregular nature, prevents updip migration along these trends.

At Frobisher, where there is only 20 ft. of structural closure, 30 ft. of gas cap is present. Thirty feet of oil zone is sandwiched between this and bottom water. It is evident that this local trap is not entirely controlled by structure. Other local accumulations in the Frobisher beds have oil pays which range up to 40 ft. in thickness and are underlain by water but only the Frobisher pool has a gas cap.

The size of these Frobisher pools in Steelman field varies from 1 or 2 wells up to a 12-well pool in the southwestern corner of the field. Since this

reservoir has also been developed on 80-acre spacing, these pools vary in area from 160 to 1,000 acres. The original discovery at Frobisher has 10 wells on 800 acres. Of the 570 wells on production in the field at the end of last year, 51 were completed in either the Frobisher reservoir or in both this and the Midale reservoir.

Production and Reserves

Daily production at Steelman on January 1, 1958, reached 31,800 bbl. per day. Considering the 570 wells capable of production, this amounts to 55 bbl. per day per well. At the end of 1957 the cumulative production totaled 12.5 million barrels of which over 9 million were produced in 1957. The comparatively high production in 1957 can be related to the tempo of development. This remained near a peak during the last half of 1956 and the first half of 1957.

Developed reserves at Steelman on January 1, 1958, were estimated to be about 80 million barrels. The bulk of this oil is, of course, in the Midale beds and less than 10% of it is in the Frobisher beds. These estimates are based on primary recovery only. A pilot water-flood project to evaluate secondary recovery from the Midale reservoir is presently awaiting final agreements prior to the injection of water.

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NEXT WEEK . . .

Don't miss Part 2 of "Northeastern British Columbia, Giant of the Future," by G. L. Gray.

Canada uncorks its gas resources

For Canada's vast, almost untouched supply of natural gas, outlets have already been planned to deliver over 10 trillion cubic feet to North American markets. Canadian gas reserves are expected by 1970 to approach 55 trillion cubic feet.

To bring this fuel to millions of future consumers, the great Trans-Canada gas line is designed to span the 2250 miles from Alberta to Ontario. Westcoast Transmission lines will carry British Columbian gas to the U. S. Pacific Northwest. A network of complementary lines will blanket Western Canada's fields. All this at a cost close to $600 millions by 1959.

The Canadian Bank of Commerce maintains a complete Petroleum and Natural Gas Department in Calgary, and more than 270 branches throughout Western Canada. For information on any aspect of the industry in Canada, write or telegraph to C. H. Munro, Manager, Petroleum and Natural Gas Department, 309 Eighth Avenue, West, Calgary, Alberta.

(*We regret that we cannot advise on the merits of oil or mining securities.*)

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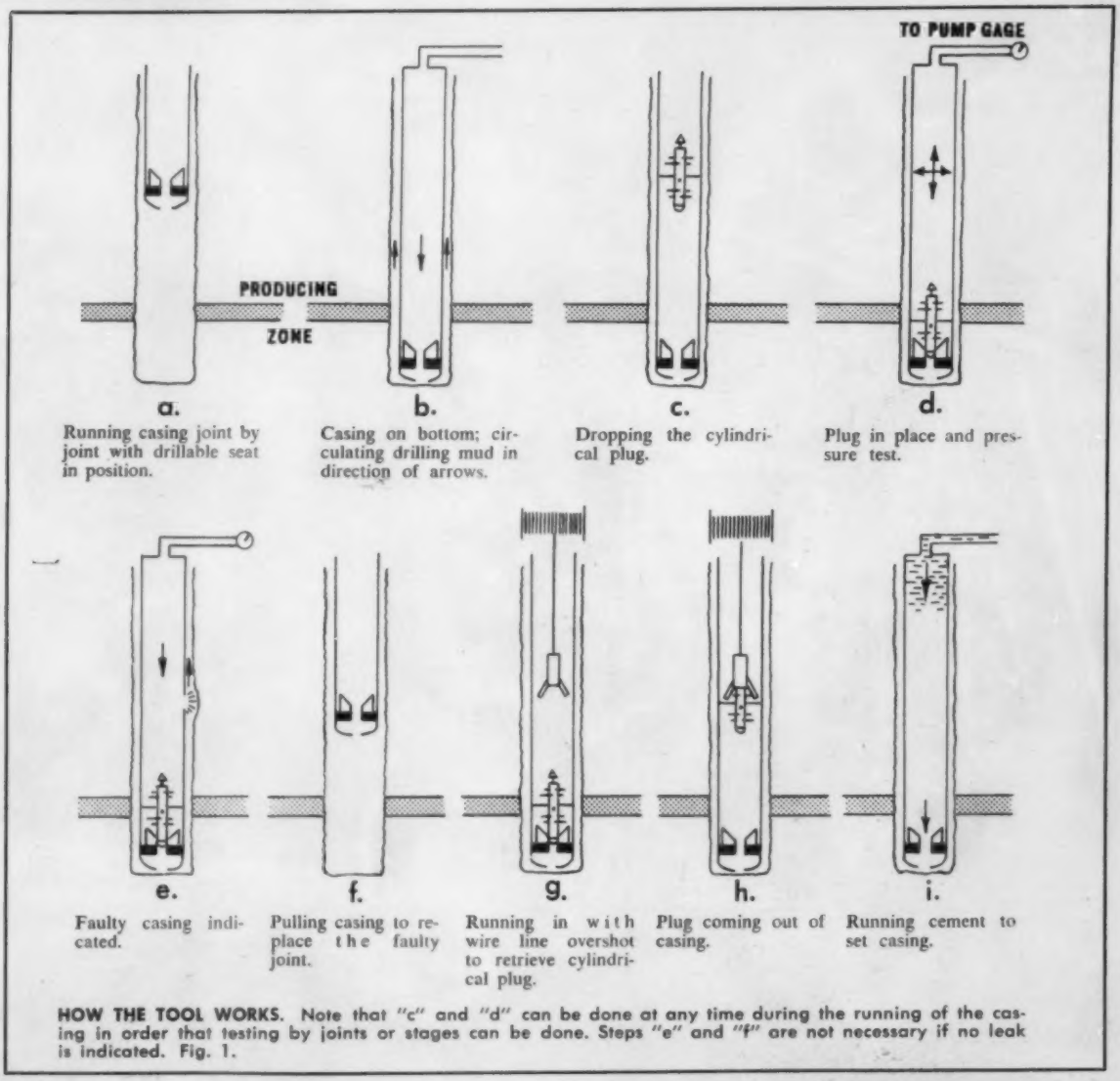

a. Running casing joint by joint with drillable seat in position.

b. Casing on bottom; circulating drilling mud in direction of arrows.

c. Dropping the cylindrical plug.

d. Plug in place and pressure test.

e. Faulty casing indicated.

f. Pulling casing to replace the faulty joint.

g. Running in with wire line overshot to retrieve cylindrical plug.

h. Plug coming out of casing.

i. Running cement to set casing.

HOW THE TOOL WORKS. Note that "c" and "d" can be done at any time during the running of the casing in order that testing by joints or stages can be done. Steps "e" and "f" are not necessary if no leak is indicated. Fig. 1.

Field tests in Canada prove

New casing-testing tool

Operators save $250,000 during first year of operation

BY LARRY C. M. DARLING

A NEW TOOL, dubbed the "CFE" tool by the oil companies (C-asing F-ailure E-limination) appears to be the answer to the problem of testing casing in the hole before it is cemented.

The first practical job was done in the fall of 1956. Exceptionally few troubles were encountered in field proving the method, and in the first year of operation 23% of all the production casing strings run in Canada used the CFE tool. Testing of surface and intermediate strings has not been done to date but the application is apparent.

How it operates . . . A drillable seat is placed above the float collar or shoe, then the casing is run and cir-

THE AUTHOR

Larry C. M. Darling is president and general manager of Macro, Ltd., Calgary, Alta. Born in Edmonton, he majored in geology and petroleum engineering at Alberta and Texas universities. Prior to forming Macro, Ltd., Darling practiced professionally in both Alberta and Saskatchewan.

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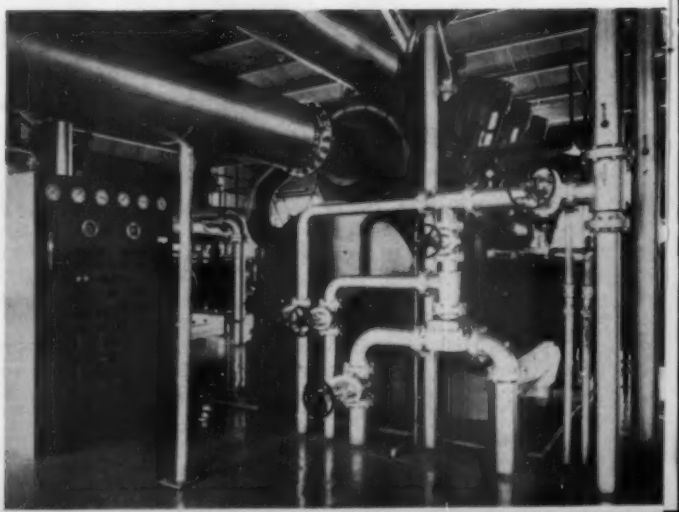

Cooper-Bessemer 2000 hp compressor in the mainline Mullinville, Kansas station of Northern Natural Gas Company.

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CASING FAILURES like this can be detected downhole before cementing. Fig. 2.

culated in the usual manner (Fig. 1). A plug is dropped inside the casing and it falls into the seat, allowing the casing string (or portions) to be pressure tested. Should a leak be detected, the casing is pulled and the faulty joint replaced. After testing, the plug is retrieved with a sand line or a piano line and cementing operations then commence.

Disadvantages . . . It was originally thought that "heaving" formations would limit the use of the method in not allowing the casing to be pulled should a leak be detected. It has been found that the new low-water-loss muds have decreased this problem a great deal.

The operation uses approximately 1 hour extra rig time and the casing is sitting uncirculated during this time. It was found that it is desirable to circulate the casing before running the test, in order that the hole be in good condition.

Advantages

1. This is probably the cheapest method of testing casing before cementing that has ever come out.
2. The test is done in the condition and final position in which it will be used.
3. The faulty joint is replaced rather than repaired.
4. The couplings are tested as well as the joints.
5. Results are independent of human failings.
6. Lighter casing of the proper weight may be used at an additional saving to the operator.

CASING FAILURE still in the string is detected by the CFE tool. Operator Al King, seen in foreground, records it as casing failure No. 10. Fig. 3.

Performance Data

A total of 205 tests (1,035,250 ft.) were done to March 31, 1958. Average length of the strings were 5,050 ft. and total depths of the holes varied between 10,850 and 3,500 ft. Twenty per cent of the strings tested were done in "stages" while running in the hole, and all the strings run were new pipe save for one string of used pipe.

Seven casing failures (see Fig. 2) were detected (approximately 3.3%) and these were replaced at an average cost of $800 each. The failures were found at depths varying between 750 and 4,200 ft. and were indiscriminate as to manufacture, weight, grade, or range.

The pressure used in testing the casing was 85% of the listed (API) internal yield pressure in all but 22 of the tests. The remaining 22 indicated no failures and the pressures used were from 50 to 84% of the listed API internal yield pressure.

Availability . . . The tool and service are rented to oil companies by licensed oil-well service companies, which companies supply personnel and equipment necessary for the job. Ordinarily there is a high pressure-volume pump available on the lease for cementing purposes and this is used for the pressure test. No license has been granted for this service to be offered in the U.S.A. as yet; however, it is expected to be made available in all major areas within the next few months.

Conclusions

1. The additional cost in testing casing by this method can be warranted by the savings realized.
2. The 3.3% failure which has been located, while appearing high, is indicative of a greater number of wells than is generally presumed, of having faulty casing.
3. An estimated $250,000 saving has been realized by Canadian operators through use of this method, in its first year of operation.
4. It is not necessary to overdesign casing strings for increased safety factor when this method is used.

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2. Recommended Practices for Care and Use of Casing, Tubing, and Drill Pipe," API, June 1956.

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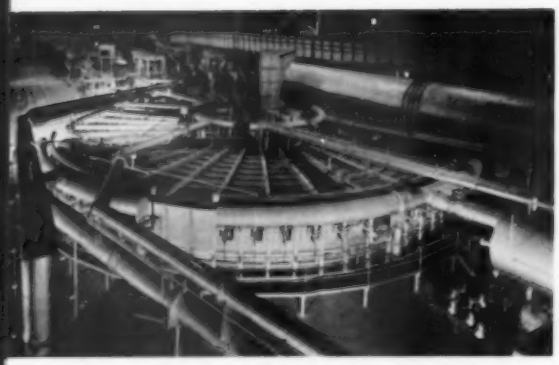

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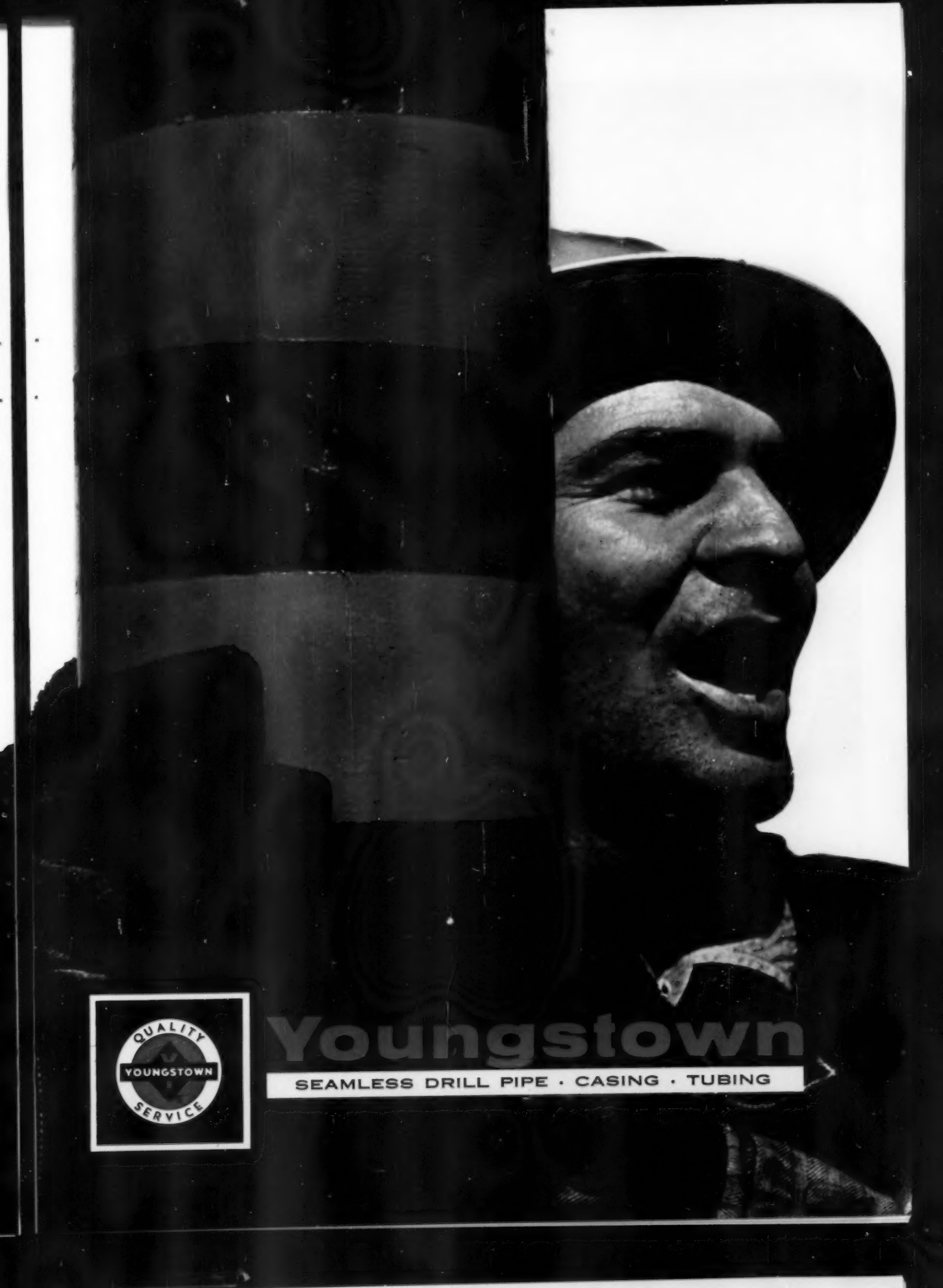
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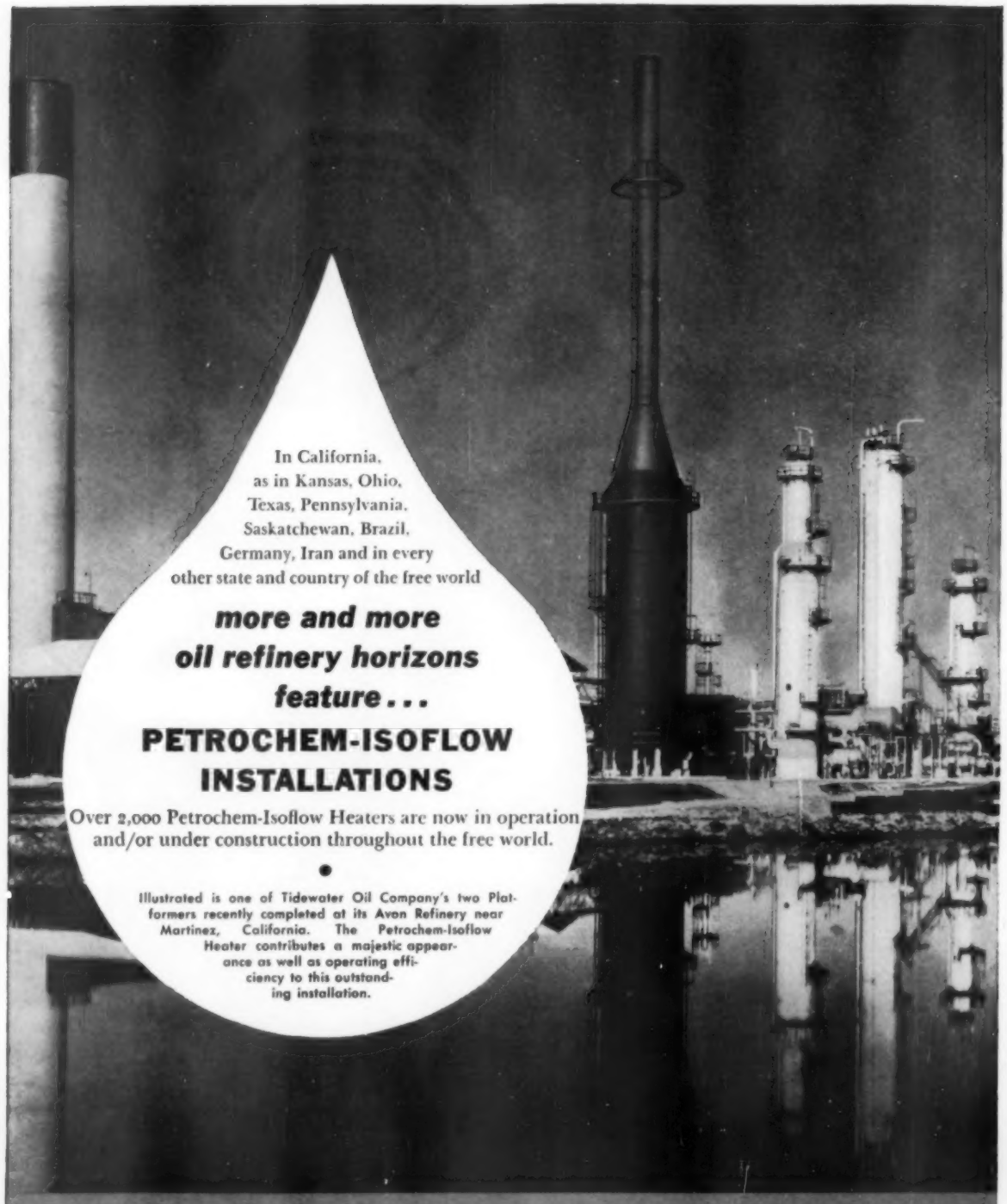

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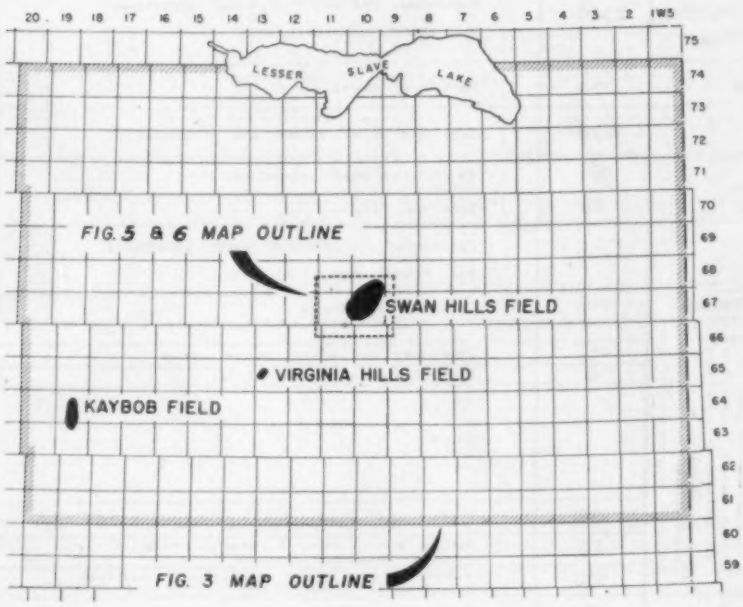


Fig. 1.

Newest Major Oil Province at Swan Hills, Alberta

Three fields have begun development, two indicating probable major reserves

A SPARSELY EXPLORED portion of North Central Alberta was brought into great prominence in the early part of 1957 by several widely separated oil and gas discoveries in the Beaverhill Lake formation of Devonian age. In the 18 months since the first discoveries, more successful exploratory wells have been drilled, and three oil fields have begun development. Two of these fields indicate probable major oil reserves, but their limits are not yet defined. Although Beaverhill Lake oil was discovered in Alberta southeast of Peace River town in 1953, these 1957 discoveries first drew industry attention to the potentialities of the formation.

Swan Hills oil field lies about 125 miles northwest of Edmonton in an almost completely unsettled area. Access to it now is mainly by aircraft, although forestry roads, which are usable only after freezeup in the winter and during very dry weather in the summer, extend into the area from the north, south, and southeast. The Swan Hills reach an elevation of about 4,500 ft. above sea level, with relief of more than 2,000 ft. Although forest cover is dense, much of it is noncommercial. The only good commercial stands lie in some of the river valleys.

Stratigraphy . . . The sedimentary section is about 9,500 ft. thick in Swan Hills field, increasing to about 10,500 ft. southwestward due to topography, regional dip, and regional thickening. Sediments range in age from Cambrian to late Tertiary with several hiatuses due to nondeposition and erosion (see Fig. 2).

- **Cambrian:** The Cambrian consists of interbedded shales, sandstones, and dolomites. This group thins northward and northeastward, due to pre-Elk Point erosion. Several sands, and one dolomite horizon, are porous, and some oil staining has been observed.

- **Elk Point formation:** Within the Swan Hills area, the Elk Point is relatively thin, and consists of shale, anhydrite, limestone, siltstone, and sandstone. The formation thickens eastward and northeastward at the expense of the underlying Cambrian. The Gilwood sand, at or near the top of the formation, had a minor light oil show in Home et al. Regent Swan Hills 8-11 well, but no commercial production has yet been obtained.

- **Beaverhill Lake formation:** So far the most important producing horizon in the area, this formation may be subdivided into two members. The lower portion has been referred to as the "Slave Point," basal Beaverhill Lake or Beaverhill Lake reef. In this article, it will be referred to as the Lower Member where it is predominantly nonreefoid, and as the Beaverhill Lake reef where it is predominantly reefy and shows strong vertical development. The difference in implication of the two terms is actually one of degree, since there appears to be a complete gradation of lithology from one to the other.

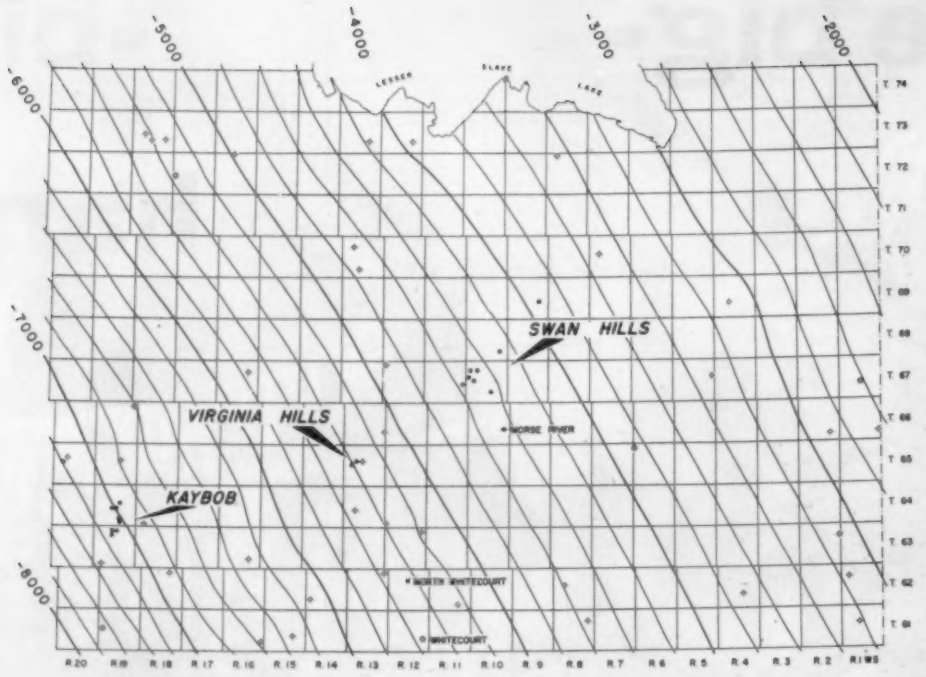
The Lower Member is typically a more or less highly fossiliferous relatively clean limestone, becoming somewhat shaly at the very base. This member thins eastward and southeastward and becomes less fossiliferous and more argillaceous, and cannot be differentiated there from the upper member. Locally, the Lower Member is strongly reefoid in character, and grows upward through the Upper Member, occasionally extending to the very top of the formation. It is this reefoid development of the Lower Member of the Beaverhill Lake in which the commercially important hydrocarbon accumulations occur.

The Upper Member of the Beaverhill Lake consists of interbedded limy shales and hard, dense, argillaceous limestones. The thickness varies, depending upon the amount of upward growth of the Beaverhill Lake reef. No compaction folding has been observed in the Upper Member over the reef, probably because the lime content of the Upper Member is great

TABLE OF FORMATIONS

AGE	SWAN HILLS AREA	THICKNESS IN FEET	LITHOLOGY
TERTIARY	Un-named		Surface gravels
	Paskapoo	2300	Continental and brackish water sandstones and shales with coal beds.
UPPER CRETACEOUS	Edmonton – Belly River		
	Lea Park	390	Dark grey shales.
LOWER CRETACEOUS	Colorado	1220	Grey and brown shales and mudstones.
	Viking	110	Quartz and chert sandstones.
	Joli Fou	20	Dark grey shales.
	Bluesmore	690	Continental and brackish water sandstones and shales with coal beds.
	Quartz Sand Series	200	Quartzose sandstones.
JURASSIC	Unconformity		
	Fernie	45	Dark grey and brown marine shales.
	Nordegg	110	Bituminous, calcareous shales.
TRIASSIC	Unconformity		
PERMIAN			
PENNSYLVANIAN			
MISSISSIPPIAN	Shunda	100	Light brown, argillaceous, silty limestone.
	Pekisko	180	Buff, fine crystalline, fragmental and crinoidal limestone.
	Banff	630	Siltstones, grey, green, argillaceous limestones, and grey to brown shale.
	Exshaw	15	Bituminous shale.
DEVONIAN Upper	Wabamun	820	Light brown, dense limestones, with traces of anhydrite.
	Graminia	190	Light brown, silty dolomites, and medium crystalline dolomites.
	Shale Unit	1290	Green, calcareous shales with minor dense, argillaceous limestone beds; some bituminous shales.
	Beaverhill Lake Reef / Beaver River Lake	475	Interbedded green shales and light brown, argillaceous limestones; some bituminous shale.
Middle ?		60 – 475	Bioclastic and reef limestones.
	Gilwood Sand / Elk Point	130 – 1100	Dark green and red shales with quartzose sandstones.
SILURIAN	Unconformity		
ORDOVICIAN			
CAMBRIAN Upper			
Middle			
Lower	Cambrian	0 – 970	Red and green micaceous, glauconitic sands, shales and dolomites.
	Unconformity		
PRECAMBRIAN			Crystalline, igneous and metamorphic rocks.

SEDIMENTARY SECTION at Swan Hills is 9,500 ft. thick, and increases in thickness toward the southwest. The beds range in age from Cambrian to late Tertiary. Fig. 2.



STRUCTURAL CONTOURS on the top of the Beaverhill Lake formation reveal only minor departure from the regional structure. Contour interval is 200 ft. Fig. 3.

enough to have developed rigidity soon after deposition.

The combined thickness of the two members is remarkably uniform indicating that Beaverhill Lake reefing has had little or no influence on later sedimentation.

● **Devonian shale unit:** This unit is the equivalent of the Cooking Lake, Duvernay, Ireton, Nisku, and Calmar formations of the Edmonton area. Facies changes northwestward from Edmonton have resulted in the shaling out of the Cooking Lake and Nisku formations so that the Ireton facies is greatly expanded. This unit consists largely of shale and calcareous shale with minor dense argillaceous limestone beds. The upper portion is silty.

● **Graminia formation:** These beds consist of dolomite and siltstone. The dolomites are frequently highly porous, but so far have given only water on test in this area.

● **Wabamun formation:** The Wabamun is largely fragmental and chalky limestone, with minor dolomite and traces of anhydrite towards the base. Although logs indicate very thick porous sections, only minor visible porosity is present. No shows have been recorded so far.

● **Banff formation:** Shales, limestone, siltstones, and sandstones comprise this formation. Heavy oil staining is frequent in the siltstones and sandstones and in traces of porosity in the limestones. Sandstones at the top of the formation, although well stained with heavy oil, have yielded salt water on drill-stem test. The pre-Cretaceous erosional surface cuts into the Banff to the east and south of Swan Hills field.

● **Pekisko formation:** The Pekisko lies immediately below the pre-Cretaceous erosion surface in Swan Hills field, and has been eroded to varying degrees there. It consists of fragmental and chalky limestone, with scattered porosity and heavy oil staining. Drill-stem tests have yielded only very minor gas and heavy oil shows. It will probably be impossible to properly evaluate this horizon until a completion is attempted in it.

● **Shunda formation:** The Shunda formation is eroded away in Swan Hills field, but the lower part is pres-

SURVEYING CREWS run right-of-way lines through the densely forested Swan Hills of West Central Alberta. Fig. 4.

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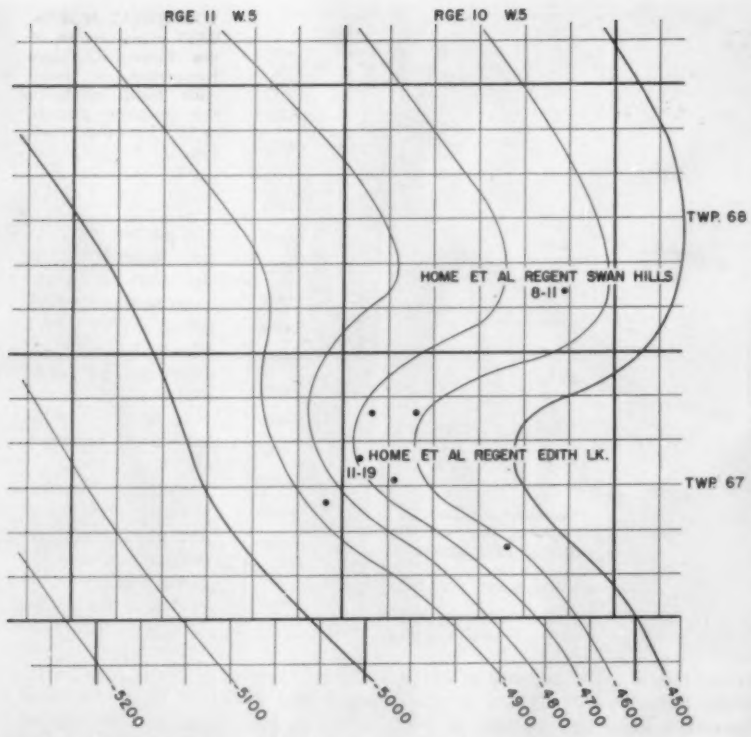
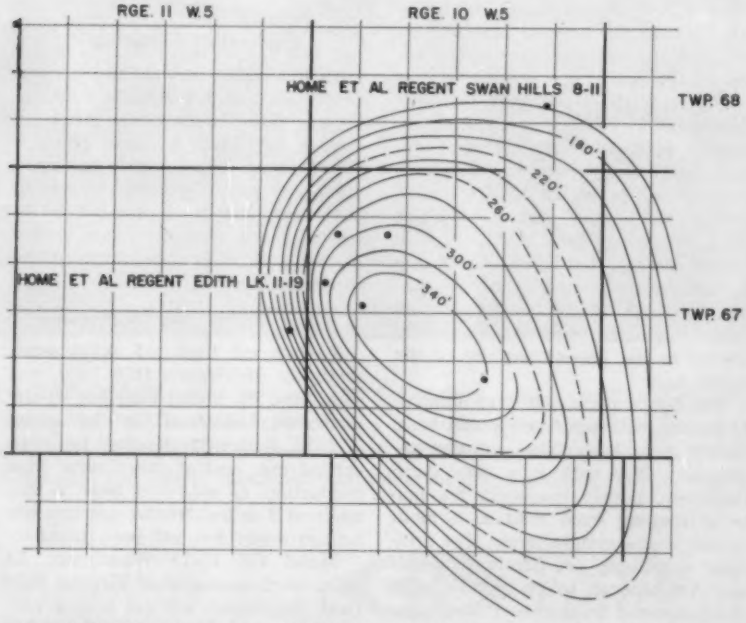


TOP OF THE BEAVERHILL Lake reef presents this picture in Swan Hills field proper. Contour interval 100 ft. Fig. 5.

ent at Virginia Hills field. There, it is limited upward by the pre-Jurassic erosion surface. It consists of interbedded shale and limestone, and is essentially nonporous.

● **Jurassic:** Some Jurassic is present at Virginia Hills, but it does not extend as far to the northeast as Swan Hills. Porosity is absent.

● **Cretaceous:** The Cretaceous of the Swan Hills area is generally comparable to that of Central Alberta,



REEF THICKNESS MAP in Swan Hills field, with 20-ft. contour interval, gives some clue to eventual size of the structure. Fig. 6.

and requires little discussion. Basal Blairmore and Viking sands offer possibilities of hydrocarbon entrapment. The former yielded substantial gas at one well at Virginia Hills, but the sand there appears to have little lateral extent.

● **Tertiary:** The Swan Hills are an erosional remnant of a late Tertiary peneplain, comparable to the Cypress Hills and Hand Hills of southern Alberta. An outlier of the Upper Paleocene - Paskapoo formation is consequently preserved here. The higher elevations are capped by presumably late Tertiary preglacial gravels. These gravels cause difficulty in seismic exploration, but will be of great importance as a source of road-building materials.

Structure

The structure in the Swan Hills, as known, is simple. The regional strike varies from N 60° W at the top of the Lower Cretaceous, to N 30° W at the Beaverhill Lake level. The dip is to the southwest, at about 40 ft. per mile on the top of the Beaverhill Lake at Swan Hills, steepening gradually southwestward. Only very minor departures from the regional are known (Fig. 3).

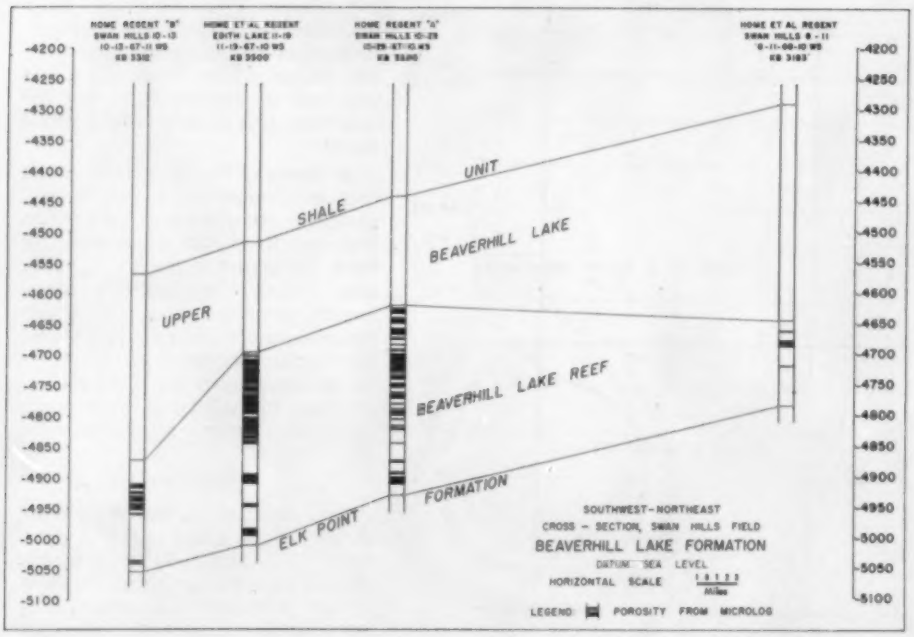
The post - Paleozoic erosional surface is apparently rather irregular. These irregularities are reflected to some extent in the Cretaceous due to draping over the erosional highs.

The surface of the Lower Member of the Beaverhill Lake, in contrast to the very regular surface of the Beaverhill Lake formation, shows strong departures from the regional pattern. These, of course, are not structural, but are due to irregular upward development of the reef.

Virginia Hills Field

Virginia Hills field was discovered by Home-Union-Hudson's Bay 9-20 Virginia Hills exploratory well, on a drill-stem test of the top of the Beaverhill Lake reef, at the end of January 1957. A total of 36 ft. of net oil pay is present, with a further 32 ft. of water - bearing porosity below. The Beaverhill Lake reef had a gross thickness of 270 ft. The well was completed, after drilling on to the Precambrian, for a potential of 864 bbl. of oil per day on a 20/64-in. choke. Gas-oil ratio initially was 540 cu. ft. per bbl. Gravity of the oil is 38.3° API.

The first stepout, 6 miles to the northeast, found the lower Beaverhill Lake thinner and nonporous. This was followed by a well ¾ mile east of the discovery. Here, the reef development was very poor, the top being some 60 ft. lower, although the well was



SOUTHWEST-NORTHEAST cross-section of the Beaverhill Lake formation in Swan Hills field, showing the porosity pattern within the reef. Fig. 7.

drilled regionally slightly updip. The third stepout, ¾ mile southwest of the initial well, found the reef slightly higher than the Virginia Hills 9-20 well, with about 42 ft. net pay.

Drilling depth to the top of the Beaverhill Lake reef is about 9,200 ft. The porosity occurs in bands separated to some extent by dense zones. No gas cap has been found, and in fact, the oil is undersaturated. The oil-water interface lies between elevations of —5,646 and —5,664 ft., but has not yet been closely defined, because in both producers, dense bands have occurred across this contact. The reservoir rock is limestone.

Swan Hills Field

Swan Hills field was discovered by Home et al.-Regent 8-11 Swan Hills exploratory well, drilled about 25 miles to the northeast of Home-Union-Hudson's Bay 9-20 Virginia Hills. The discovery drill-stem test was run early in March 1957. Only 11 ft. of net pay is indicated by logs, but additional pay through fracture porosity is suspected. The well was successfully completed as an oil producer.

This was followed up by Home et al.-Regent 11-19 Edith Lake, 6 miles to the southwest. In late August 1957 this well flowed oil to surface in 95 minutes from the top of the Beaverhill Lake reef. It found about 143 ft. of net porosity in a gross section of 315 ft.

Development drilling around Edith Lake 11-19, during the winter of 1957-1958, resulted in five additional oil wells. The maximum net pay yet found, in Home-Regent 10-10 "A" Swan Hills, 4 miles southeast of 11-19 Edith Lake, is 160 ft., in a gross Beaverhill Lake reef section of 341 ft. The range of net pay in the other four development wells is from 35 to 144 ft.

The oil is 41.7° API gravity. The crude is undersaturated, with a producing gas-oil ratio of about 550 cu. ft. per bbl. No gas cap has been found. No oil-water interface has been defined, since formation water has not yet been encountered. Drilling depth to the top of the reservoir is about 8,200 ft., but varies markedly due both to the extreme surface relief and the less extreme relief on top of the reef.

The Beaverhill Lake reef in Swan Hills field is a limestone. The lower portion is slightly argillaceous, predominantly nonporous, but frequently fractured. Some bands of effective porosity are present, and although not thick, frequently have a considerable lateral extent. The porous bands are predominantly composed of Stromatoporoid and Amphipora fossils, and fossil fragments, and are essentially similar to the porous sections of the upper part.

The upper portion is predominantly porous, with some nonporous beds. Fractures and stylolites are not uncommon. The rock is a very clean limestone, largely bioclastic, the material ranging from mud to a moderately coarse conglomerate. The principal organisms are Stromatoporoids and Amphiporae, which usually occur as transported fragments. Porosity occurs both as intergranular, and as fine vugs within the organisms. Porosity and permeability appear to be related to the amount of extremely fine lime infilling present. Minor dolomite and anhydrite infilling also occurs.

In addition to the Stromatoporoids and Amphiporae, occasional brachiopods, gastropods and other fossils are present. It may be noted that corals apparently contributed little to the reef development.

Two exploratory wells, one to the south and the other to the northeast of Swan Hills field, recently discovered oil in the Beaverhill Lake reef. McColl-Code-Mic Mac 10-14-69-9 Swan Hills, 9 miles northeast of the field, is reported to have about 10 ft. of net oil pay. Pan Am A-1 Morse River 4-13-66-10, some 5½ miles south of Swan Hills production, has indicated about 8 ft. of net oil-bearing porosity. Further drilling will be required to determine whether these wells represent new pool discoveries or extensions to Swan Hills field.

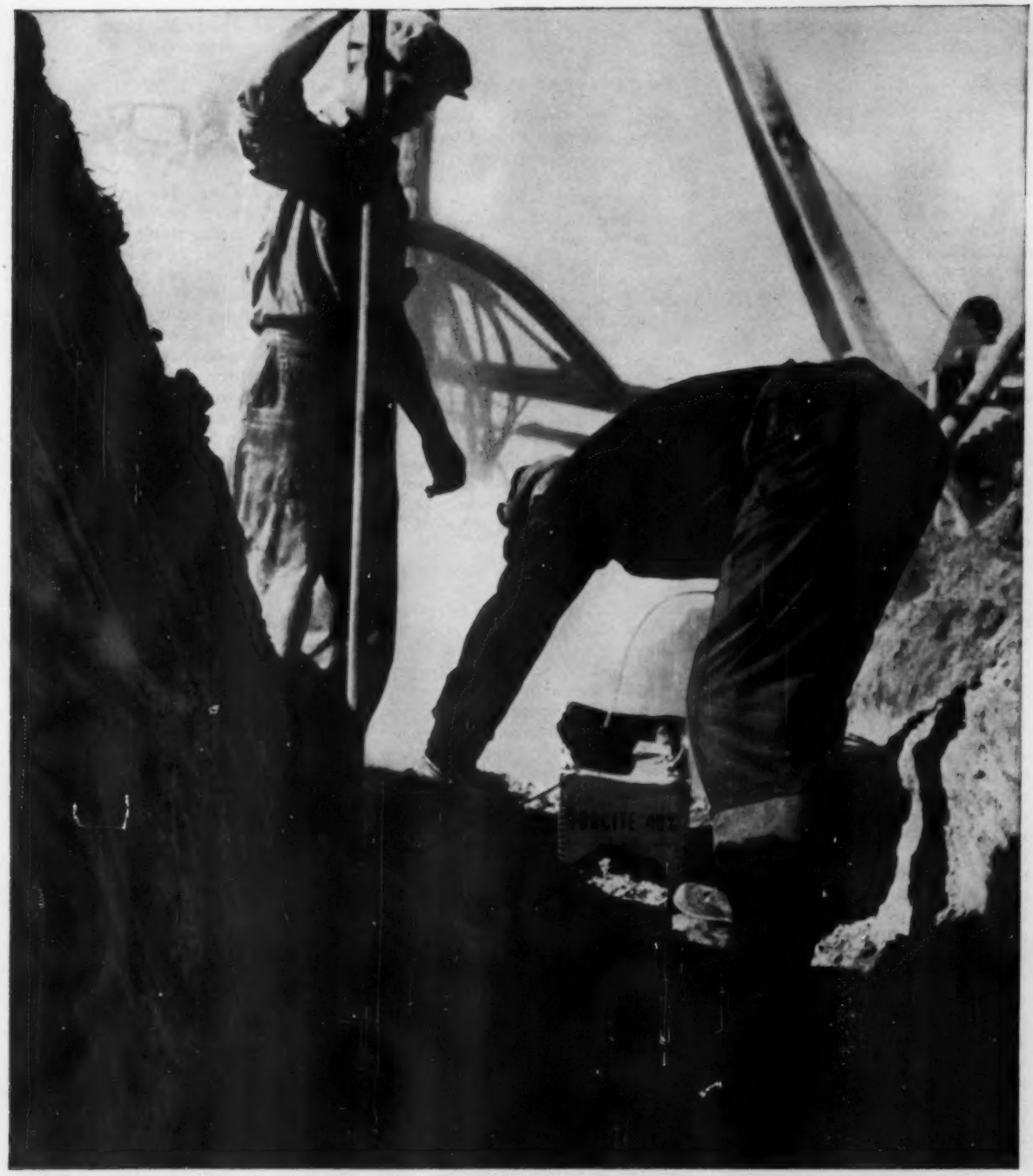
Exploratory Technique

All the exploratory drilling at Virginia Hills and Swan Hills fields so far has been based upon reflection seismograph data. A direct relationship between the seismic anomalies and development of the Beaverhill Lake reef, however, remains to be proven. Much more drilling is needed to gain a clear understanding of the problem.

Other Fields and Discoveries

Kaybob oil field, 35 miles west-southwest of Virginia Hills field, was discovered by a drill-stem test of the Beaverhill Lake reef, in the spring of 1957. Active development has been carried out, and at the present time production is indicated over a distance of 5 miles. Neither gas cap nor bottom water has yet been found.

Mobil Oil 12-13 Whitecourt, 25 miles south-southeast of Virginia Hills field, discovered wet gas with a very thin oil pay below, in the Beaverhill Lake reef, also in the spring of 1957.



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In early 1958, three exploratory wells gave encouraging oil shows in the Beaverhill Lake reef. Shell 10-17-64-13 Swan Hills, 6 miles south of Virginia Hills field, and Pan Am A-1 Morse Creek 6-36-62-13, some 9 miles farther to the south, were subsequently abandoned as noncommercial. Mobil 8-28-62-12 North Whitecourt, about 4 miles southeast of Pan Am A-1 Hope Creek, is probably a commercial oil well, but has not yet been completed.

The high ratio of discoveries and substantial shows of oil and gas in the Beaverhill Lake reef over an area of about 3,500 sq. miles of northwestern Alberta indicates that a most important hydrocarbon subprovince has been discovered. The difficult terrain will retard exploration and development to some extent, but increasing activity is to be expected. Numerous exploration problems exist, to be solved only with further drilling. The reflection seismograph appears to be a usable tool in exploration for these reefs.

Well Sites

All well-site clearing will now be undertaken on a per acre contract basis. This phase of the operation includes falling, trimming, topping, and decking of all timber in excess of 4 in. in diameter. All earth work will be done on an hourly contract basis. Consideration was given to contracting earth work on a yardage basis; however, due to the many problems encountered with muskeg, differences in elevation within a well-site area (as much as 100 ft.), it has been found that completing this work on an hourly basis is more advantageous. In accordance with existing forestry regulations, timber disposal must be complete and each lease being reclaimed must be completed in such a manner that second growth can occur within the well-site area that is not required during the producing life of the well.

Several small sawmill companies have expressed interest in moving into the area and purchasing this decked timber, either outright or on a share basis. Although no definite commitments have been made, it seems safe to assume that a program of this nature will be carried out.

The average cost of clearing, preparing, and reclaiming a 400 by 400-ft. well site is estimated at about $8,000. There are, of course, certain areas where this cost will be considerably less, and, where severe muskeg conditions exist, it will be considerably higher.

Road Construction-Grid System

Locating right-of-way . . . Aerial photography has played a most significant part in locating the various routes that go to make up the grid system. The procedure presently used in the Swan Hills area is to obtain as much data as possible from the mosaics, contour maps, soil maps, etc., and from this information plot proposed routes on the contour maps. Next, the proposed right-of-ways are checked from the air, preferably by helicopter, and any variations in the proposed right-of-ways are noted. Finally, the route is checked on the ground and although this necessitates a great deal of work, considerable savings can be realized. Usually, a single line survey of the proposed roads is then undertaken, the legal survey being carried out after completion of the road.

Construction . . . Although various construction procedures have been adopted in oil-field road construction, experience in this area indicates that where stripping had been completed prior to building the grade, no serious difficulties were encountered. Because of the many variations in soil conditions, a certain amount of channeling to provide proper drainage was necessary.

A minimum of 90-ft. right-of-way is required. As much as possible, roads will be built on the sunny slope of the right-of-way; in a heavily timbered area, this assists materially in drying. All roads constructed will be 22 to 24-ft. crown, with a 2 to 1 slope and 3-ft. vertical bucket-type ditch. In order to avoid destruction of as much timber as possible, flowlines will follow the right-of-ways and be buried in the ditches.

Initially, it is intended to gravel all roads with a minimum of 2 in. of 1½-in. crushed gravel. It is expected that an additional 2 in. of gravel will be required within 1 year. A considerable amount of dragline work will be necessary in order to drain the road bed, although, in certain areas, where large gravel deposits are present, this will not be necessary.

With the limited experience gained to date in this area, it would appear that if proper drainage is provided for the road bed, maintenance costs on roads will not be abnormal.

Drilling and Completion

All drilling to date in Swan Hills field has been with contract rigs working on a footage basis. These rigs are of 8,000 to 10,000-ft. capacity and are equipped with 4¼ or 5-in. drill pipe. Portable camps for the crews of necessity accompany each rig. Movement of the rigs as far as 200 miles by road is by truck.

Surface hole is drilled to approximately 600 ft., with either a 9-in. bit and reamed to 13¾ in., or drilled with a 13¾-in. bit. Ten and three-quarter-inch surface pipe is run. Below surface casing, drilling is continued with 9-in. bits. Fifteen to twenty 6¾-in. drill collars are included in the drilling string. Forty to fifty thousand pounds of weight is carried, with about 100 to 110 r.p.m. No deviation problems have been encountered. Conventional rock bits are used since jet bits have shown no particular advantage. Mud used has a bentonite base, treated with small amounts of diesel oil and emulsifier.

All rigs are complete with hydraulic blowout preventers consisting of blind rams, pipe rams, and Hydril-type preventer.

Stuck drill pipe and casing have occasionally presented a problem. Reasons for this are not clear and are still being investigated.

The pay horizon is usually drilled into just far enough to be recognized and is then completely cored in about 50-ft. intervals with a 6⅛-in. diamond head. The hole is reamed to full diameter with rock bits following each core. Use of full diameter diamond coring is being considered.

From spud in to coring point, at about 8,200 ft., drilling is reasonably easy and requires only about 25 days. A 50-ft. core can be cut and reamed in a little over 24 hours if no difficulties are encountered.

Five-and-one-half-inch production casing is run to total depth and is cemented in either one or two stages. This is jet perforated while mud is still in the hole, after which 2½-in. tubing is installed. Following a small acid treatment, the well is flowed or swabbed into production.

Acknowledgments . . . The writers acknowledge with thanks the assistance rendered in the preparation of this paper by other members of the staff of Home Oil Co., Ltd. In particular, Alex Clark, vice president in charge of exploration; George Fong, stratigrapher, and Ellis Walker, district geologist, aided materially with data, suggestions, and constructive criticism.

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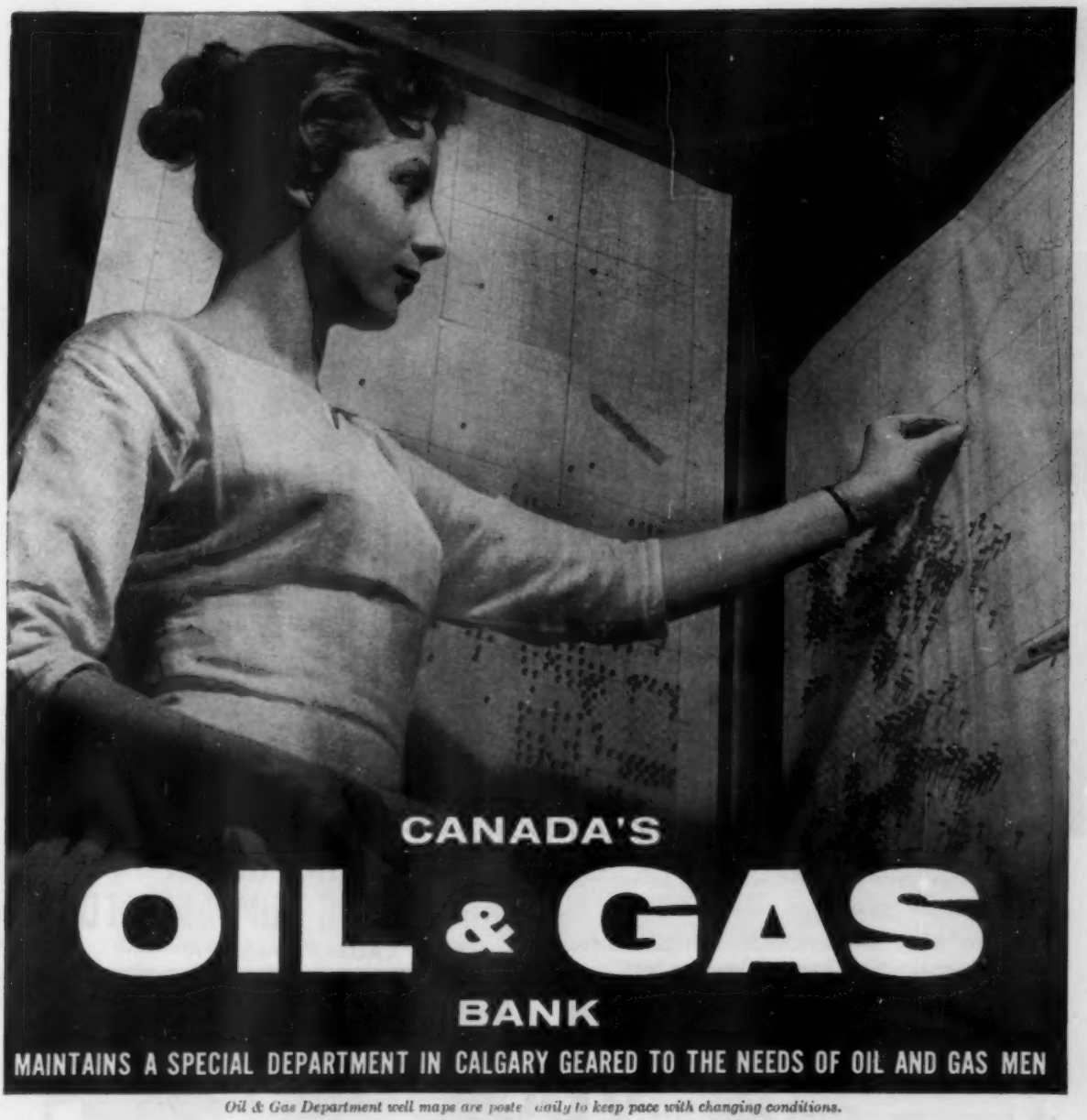

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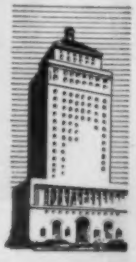

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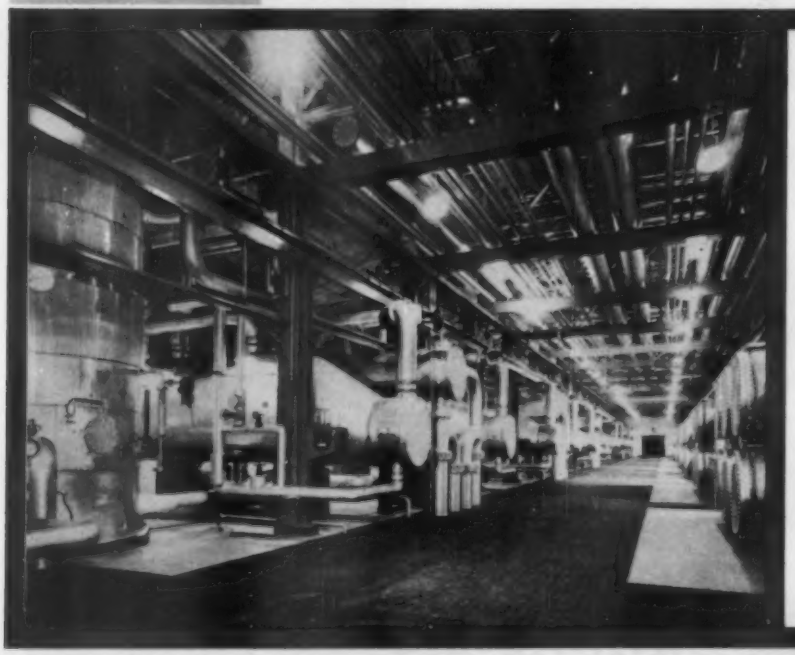

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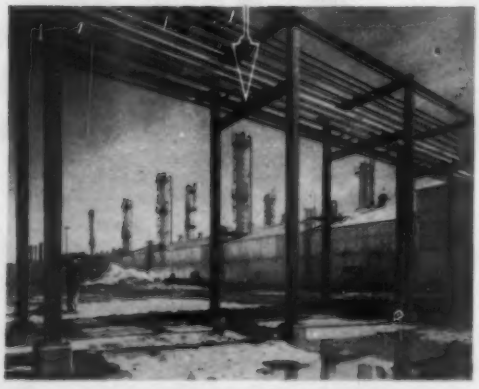

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SAVANNA CREEK GAS FIELD lies in the Alberta foothills and the structure of the area is typically complex. Fig. 1.

Photogeology—it cuts time in surface mapping and is aiding exploration in western Canada

BY PAUL FUENNING AND ANDY J. BROSCOE

RECONNAISSANCE photogeology has proven to be a valuable tool in oil exploration in the outcrop areas of the eastern part of the Canadian Cordillera. Geomorphic studies are providing some structural information in the heavily glaciated Interior Plains. Compared to other mapping methods, photogeology requires less time, is considerably less expensive, and is not hampered by unfavorable weather or terrain. The use of photogeology has altered the approach to surface evaluation for many companies operating in western Canada. Detailed and quantitative evaluations offer further aid for petroleum exploration in Canada.

Photogeology is the mapping of surface geology through the stereoscopic examination of vertical air photographs. Compared to conventional field methods, it offers an appreciable reduction in cost and time in the mapping of surface geology. This is particularly true in Canada.

Photogeology has been used in Canada to a limited extent in mining geology and to greater degree in petroleum geology. On the Canadian

TYPICAL FOLD near the western margin of the Interior Plains of British Columbia is evident on aerial photos. Fig. 2.

Shield of East and Central Canada and in the mining districts of interior British Columbia and southern Yukon, fracture patterns, joints, and faults, and the gross differentiation of rock types have been used in the search for areas of mineralization. This paper, however, will deal primarily with petroleum exploration.

Where used . . . In petroleum exploration, photogeology is very well suited to the mapping of the Rocky Mountains and foothills of Alberta and British Columbia, the mountains and basins of Yukon and Northwest Territories, and the western margin of the Interior Plains. In these areas, the surface geology is readily apparent on the air photographs. Photogeology has been used extensively in this area in the past 6 years, and is now being used by many oil companies as the first step in any evaluation of the eastern part of the Canadian Cordillera or the western margin of the Interior Plains.

Conventional photogeology is not applicable to the greater portion of the Interior Plains, due to the relatively horizontal attitude of the sedimentary rocks, which are usually mantled by glacial deposits. In this area, geomorphic evaluations of various types have been used with varying degrees of success. The geomorphic approach has only recently been extensively applied to the Interior Plains.

Status of photography . . . Vertical air photography is available from the dominion, the provinces, and commercial sources. All of Canada is covered by dominion photography, at an average scale of 1:40,000. The scale of the Alberta government photography averages 1:40,000 and 1:20,000. Alberta is completely covered by the 1:40,000 scale photography, whereas only portions of the province are covered by the 1:20,000 scale. Alberta is now rephotographing portions of the province. The scale of British Columbia photography averages 1:40,000 and 1:15,000. That province is also engaged in an active rephotographing program. The Saskatchewan government has available photography at varying scales. Commercial photography is quite limited compared to the other sources. Though more expensive, commercial photography is generally of exceptionally high quality.

Information regarding dominion, Alberta, British Columbia, and Saskatchewan government photographic coverage for any particular area can be had from the aforementioned sources upon request. The average cost of the 1:40,000 scale photog-

FUENNING

The authors

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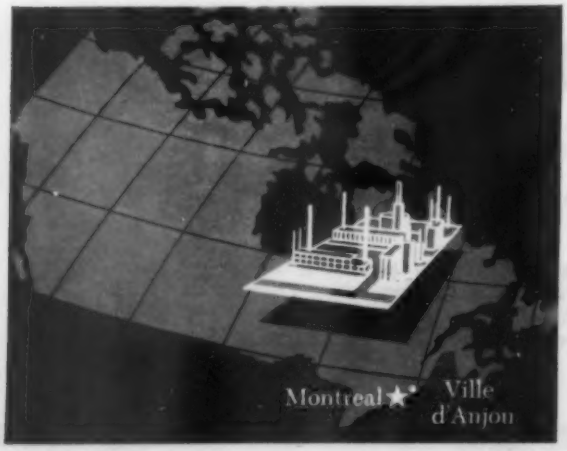

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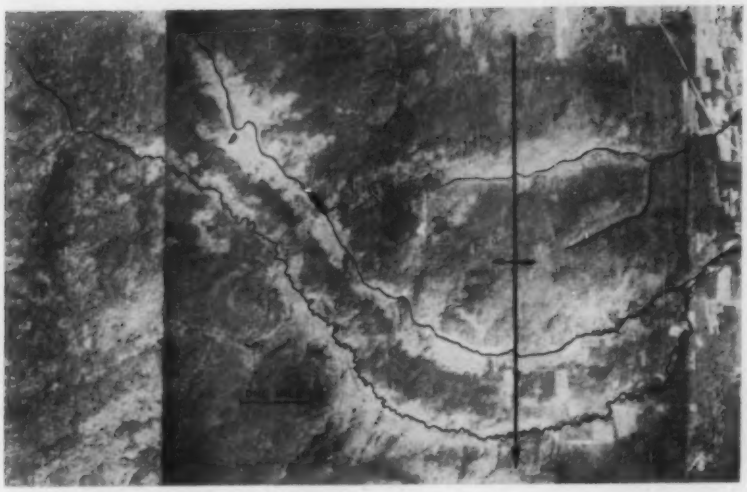

ANOMALOUS DRAINAGE PATTERN in the Interior Plains of British Columbia has been confirmed by seismic investigation as an anticline. Fig. 3.

raphy is 10 to 15 cents per square mile, and larger scale work is proportionately higher.

Uncontrolled mosaics of limited areas are available from the dominion government. These mosaics, which are useful in examining the gross topography of an area, are generally constructed so that the hydrographic features tie. Consequently, in areas of high relief where a large variance of scale occurs within a single air photograph, mountain peaks are often omitted. Mosaics which are to be used as compilation media should show a maximum amount of topography. Consequently, the dominion government mosaics are considered media of geologic data.

Petroleum exploration . . . Photogeology can be divided into reconnaissance, detailed and quantitative photogeology. The first two are generally dependent upon scale. Detailed evaluation requires a scale of 1:20,000 or larger, preferably a scale of 1:10,000. Consequently, any scale less than 1:20,000 is adequate only for reconnaissance photogeology.

The current status of most of the photography in Canada does not permit extensive areas of detailed evaluation, whereas the 1:40,000 scale work which covers all of Canada is well suited for reconnaissance-type photogeology.

Quantitative photogeology is the application of mechanical measuring devices, such as the Kelsh plotter or various parallax-bar-type instruments, to compute actual dip values, stratigraphic thicknesses, elevations on key beds, and other similar data on the air photographs.

Reconnaissance Photogeology

Primary purpose of any reconnaissance work in the Canadian Cordillera is to obtain stratigraphic or structural leads. Much of the eastern Cordillera is complexly faulted and folded. Production in this area is limited to the foothills of British Columbia and Alberta, and the MacKenzie basin of the Northwest Territories, which include such fields as Turner Valley, Pincher Creek, Savanna Creek, and Norman Wells. Recent discoveries in the Waterton area, Alberta, have created greater interest in the foothills. Extensive land acquisitions within recent years in western Northwest Territories and northern Yukon indicate interest in these areas.

Structural studies . . . Regional reconnaissance photogeologic studies in a complexly folded and faulted area present data from which the overall tectonic trend of folds and faults is established; from these, anomalous structural trends and regional highs are isolated. Savanna Creek anticline shown on Fig. 1 is an example of a structural high in the foothills of Alberta. The surface picture must be known in order to intelligently infer the structure of the subsurface. A study of the behavior of thrusting and folding in a regional study has been proved valuable in the construction of cross-sections. Trends of transverse highs or culminations can be projected to the east into the Interior Plains to suggest favorable areas for seismic investigations.

Stratigraphic studies . . . Reconnaissance photogeology is well suited for stratigraphic studies, in which formations and rock units can be delineated for considerable distances. Variations in the facies and changes in thickness are readily apparent on the air photographs. Stratigraphic information obtained in this manner in the eastern part of the Cordillera can thus be coordinated with subsurface information in the Interior Plains in the search for stratigraphic traps.

Coordination with field work . . . Reconnaissance photography has proved most useful in Canada when coordinated with field work. Due to the limited field season in Canada, which averages about 4 months, and the inaccessibility of vast areas, a prior photogeologic evaluation permits selective field work and eliminates many unprofitable areas, thereby covering much greater areas during the field season. The best exposures of any portion of a section to be measured or studied are determined on the air photographs prior to the field season. Helicopter landings or terrain access routes are plotted on the air photographs in the planning stage of the field season. Mosaics and the air photographs serve as an excellent base for location and plotting purposes, particularly in the north country, where base maps are lacking or are inaccurate.

Areas of no stratigraphic control . . . Little or no published geologic information is available in vast areas of the Yukon and Northwest Territories. In areas where surface structure is well expressed, but no information with regard to the age of the rocks is available, rock types are delineated on the air photographs, and are later identified as to age by fossil collection in the field.

Interior Plains . . . Most current oil and gas production and proved reserves are in the Interior Plains. Conventional photogeologic procedure is applicable in the extreme western portion of the Interior Plains, where stratigraphic contacts may be traced and broad folds delineated on the air photographs. Fig. 2 shows a typical example of the structure of the western margin of the Interior Plains of British Columbia. A recent gas discovery was made on this structure.

Farther to the east, because of the very nearly horizontal attitude of the surface beds and because of the thick mantle of glacial drift, the structures are not readily apparent on the air photographs. In many areas, geomorphic study is the only means of gathering structural information, short of geophysical exploration.

PHOTOGEOLOGY is used successfully in both mining and petroleum exploration in the various structural provinces. Fig. 4.

Geomorphic Studies

Three sources of information are used in a geomorphic study:

1. Where available, high-quality planimetric maps showing the drainage pattern.

2. Air photograph mosaics, showing tonal patterns and major lineaments.

3. Air photographs, which are examined stereoscopically and show glacial features and minor lineaments.

Where high-quality planimetric maps are not available, a detailed drainage pattern is delineated on the air photographs and drawn to a base map.

Drainage patterns . . . Stream patterns are considered to be anomalous and of possible structural significance when they show no obvious relationship to the glacial topographic features visible on the air photographs, and when they depart from the regional grain of the drainage. Arcuate, concentric drainage patterns are considered to be particularly significant, as they resemble the pattern of subsequent drainage around noses of plunging folds. Fig. 3 shows one such arcuate pattern which defines a fold that has been confirmed by seismic investigations.

Linear stream patterns may be developed along fault zones.

Tonal patterns . . . Kupsch (1956) has pointed out that tonal halos may reflect the presence of structurally high areas in the Interior Plains. Subtly expressed tonal patterns may also be in the form of small-scale tonal lineaments, which can be observed both on the air photographs and on the mosaics. These tonal lineaments are, in all probability, the surface expression of fractures, that is, joints or faults, in the bedrock. The method of propagation of the joints or faults through several hundred feet of glacial drift is still open to debate. Such tonal lineaments can be mapped and orientations measured and the departures of the orientations from the regional average determined, thereby locating anomalies on the basis of tonal lineaments.

Glacial land forms . . . In Canada, the primary problem encountered in doing geomorphic interpretation is to determine the effect of glaciation on the present topography. As yet, relatively little is known about the glacial geology of vast areas of Canada. Therefore, it is necessary to use the air photographs to determine as well as possible the landscape features of purely glacial origin. Such features as well-developed recessional moraines, glacial fluting, crevasse fillings, eskers, beach ridges, and sand dunes, all related directly or indirectly to glaciation, can be recognized on the air photographs. When drainage patterns show an obvious parallelism, for instance, to well-developed blowout or longitudinal sand dunes, no structural significance is placed upon a remarkably parallel set of linear stream courses.

Large-scale features . . . The above-described techniques are applicable primarily in relatively small areas. It is also possible to determine the tectonic pattern of the rocks which crop out both in the Canadian shield east of the Interior Plains and within the eastern part of the Cordillera, and detect evidence of the continuation of such structural trends into the Interior Plains both from the east and the west. These anomalies sometimes can be used to define the presence of large-scale basins and positive areas crossing the Interior Plains. The over-all fault pattern expressed in the shield is quite similar to the regional fault or joint pattern apparent as tonal lineaments within the Interior Plains.

Limitations . . . It should be emphasized that geomorphic studies involve, to a much higher degree than conventional photogeologic mapping, personal evaluation of the features visible on maps, mosaics, and air photographs. The opportunity for error is ever present. Nonetheless, geomorphically defined anomalies serve to prevent indiscriminate geophysical work.

In the search for stratigraphic traps, geomorphic studies are most likely to indicate those having some structural expression in the surface rocks, that is, due to draping over a reef or over a lenticular sandstone body. A simple porosity pinchout within a sandstone or a limestone body is not likely to be expressed in the surface. Fracture analysis is potentially capable of locating similar bodies, as the joint pattern may well show variations relating to variations in subsurface rock conditions. Both geomorphic studies and fracture analyses are somewhat difficult to interpret, since reefs or lenticular sandstones pinching out at different positions in the stratigraphic column within the same general area may all have an effect on the surface fracture pattern and drainage pattern.

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Detailed photogeologic evaluation . . . Only a limited portion of Canada is covered by large-scale photography (1:20,000 or larger) suitable for detailed photogeologic evaluation. In structurally favorable areas, which may have been isolated by a reconnaissance photogeologic evaluation, much additional information can be obtained from large-scale photographs of high print quality. Both precise delineation of structure and detailed stratigraphic study, such as the determination of facies changes and the presence of reefs in the outcrop, are possible in such a study. As new areas are covered by large-scale photography, the opportunity for detailed evaluation increases.

Quantitative Photogeology

The application of high-order photogrammetric plotting instruments to geologic mapping is a relative innovation in western Canada. Such plotters can be applied to outcrop areas for preparation of conventional, but quantitative, geologic maps, or in the plains areas to terrain analysis, where greater precision is needed. Quantitative photogeology has been described recently in some detail by Brundall and Jackson (1958), so that only a general summary of the application of quantitative photogeology to oil exploration in Canada need be made here.

Both the Kelsh plotter and Nistri photomapper are well suited to use in quantitative photogeology. Both instruments use positive reproductions on glass plates (diapositives) which are set up within projectors. By using vertical ground-control points, the projectors are adjusted in space to coincide with the position of the camera at the time the original negatives were exposed. Alternate red and green light is projected through the diapositives onto the white surface of the table of the instrument. When viewed through spectacles with corresponding red and green filters, a three-dimensional model of the terrain is observable.

The elevation of a point within the model can be determined by adjusting the height of a small tracing table, in the center of which is a small aperture, illuminated from beneath, so that the illuminated aperture coincides with the surface of the model. Measurement of the vertical movement of the model in fractions of a millimeter can be converted to elevation in feet or meters. Such an instrument obviously does not interpret geology; it measures altitudes. Under good conditions, the accuracy of measurement of the altitude is one five-thousandths of the flight height, so that 1:40,000 scale photography taken

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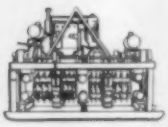
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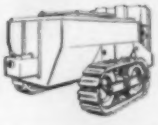
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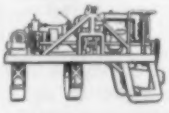
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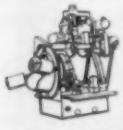
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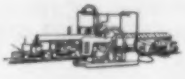
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"Geomorphic studies involve, to a much higher degree than conventional photogeologic mapping, personal evaluation of the features visible on maps, mosaics, and air photographs. The opportunity for error is ever present. Nonetheless, geomorphically defined anomalies serve to prevent indiscriminate geophysical work."

with a 6-in. focal-length lens at a height of 20,000 ft. will provide accuracy within 4 ft. for the determination of a spot elevation.

Applications . . . Numerous applications exist in Canada for such instruments. They are: (1) Structural contouring; (2) precise dip and strike determination; (3) accurate measurement of stratigraphic sections; (4) construction of profiles for use in cross-sections; and (5) preparation of local and regional isopachs of exposed rocks.

Control . . . The control necessary for orientation of the model in a high-order photogrammetric plotting instrument requires a minimum of four control points, one in the vicinity of the corner of each model, and an extra control point near the center of the model. Altitudes of such control points may be obtained by several methods:

The first is ground surveys by plane-table traverse or triangulation.

The second is the use of existing elevation information, perhaps from geophysical work. In this case, the elevation points must be located precisely on the air photographs and must be obtainable in required locations in the stereoscopic model.

Third, high-order plotters may be used to bridge between widely scattered survey points, which results in considerable saving of time and cost over ground surveys.

Finally, where air photos have been used to prepare accurate topographic maps, it is sometimes possible to use the original control points or to interpolate from the topographic maps. Because for the greater part of Canada, such accurate topographic mapping is not available, this method is naturally not applicable.

Where such precise control is not available, it is still possible, by using lakes, to level the stereoscopic model for sufficient accuracy to prepare topographic and geologic profiles. This is quite helpful in preparing

structure cross-sections, as the best topographic maps available to provide topographic control are commonly aeronautical charts on the scale of 8 miles to the inch or smaller.

Terrain analysis . . . Although terrain analysis is not photogeology in the strict sense of the word, it is a form of photo interpretation and is useful in exploration in western Canada. Terrain analysis might be defined as the determination of the obstacles which might be encountered by surface, geophysical, or drilling parties within a given area. The analysis may be of a reconnaissance nature or as highly detailed as is desired. Reconnaissance terrain analysis may consist of an evaluation of the most promising means of access to a given area and the best means of travel within that area. A detailed terrain-analysis map shows the presence of topographic scarps or steep slopes which would present obstacles to the movement of vehicles in an area, the determination of drainage conditions, and the delineation of tree growth large enough to be barriers. Such a map permits laying out seismic lines and access roads for drilling, prior to the entry of vehicles and equipment into an area.

Costs . . . The average cost of preparing photogeologic maps within the eastern part of the Canadian Cordillera is less than 1 cent per acre. The average cost of reconnaissance geomorphic studies within the Interior Plains is less than a quarter of a cent per acre. The cost is flexible, as the mapping specifications are tailored to meet the client's needs and the degree of detail necessary.

Systematic mapping program . . . Although photogeologic maps of relatively small areas provide a considerable quantity of information, a better overall understanding of the geology of a large area can be gained through a systematic mapping program. When such a systematic mapping program is coupled with a field check using helicopter operation, a surprising amount of area can be mapped in considerable detail in a relatively short time. More and more oil companies operating in Canada are following this procedure. The possession of reconnaissance geologic maps provides an excellent basis for guiding further exploration.

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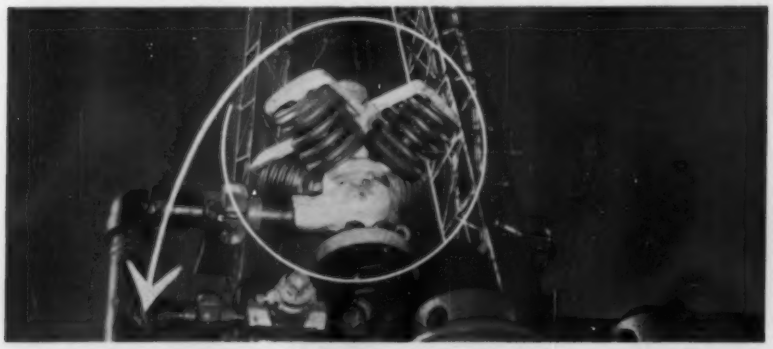

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SOUTHWEST TEXAS
San Angelo
TEXAS GULF COAST
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El Campo
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Houston
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GO CONTINENTAL-EMSCO

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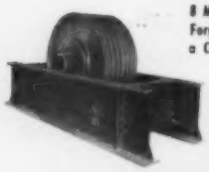
MATCHED DRILLING EQUIPMENT

Don't take hoisting and rotating equipment for granted. We don't at Continental-Emsco. From crown block to rotary, each item meets C-E's high standards of design, engineering, manufacturing, inspection and service. This assures peak performance and long life. All Continental-Emsco equipment is backed up with *experienced* field service and availability of parts throughout Continental-Emsco's *worldwide* sales and service organization.

CROWN BLOCKS
8 Models up to 600 Tons Capacity
Forged Steel Rim Sheaves . .
a Continental-Emsco Original



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14 Models up to 600 Tons Capacity
Continental-Emsco Originated
Forged Steel Rim Sheaves

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8 Models up to 350 Tons Capacity
Continental-Emsco Blocks combined
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6 Models up to 27½"

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4 Models up to 400 Tons Capacity
One-Piece Cartridge-Type Washpipe
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gives you engineering superiority . . field proven dependability . . worldwide service

Continental-Emsco can equip any rig with blocks, swivels and rotary machines designed, engineered and field proven for top rig efficiency and faster, trouble free drilling operation.

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Green Triangle FLEXIBLE HOSE UNITS

REDUCE HOSE MAINTENANCE COSTS AND RIG DOWNTIME

These high-quality hose units . . manufactured by New York Belting and Packing Company . . are reinforced against hard rig usage and are quickly connected and disconnected for time-saving moves.

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with built-in couplings . . pipe breakage greatly reduced by vibration-absorption qualities . . connections stay tight.

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. . super safe . . flexible water hose for shale shakers . . wash-down hose . . mud-system connections.

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with built-in nipples . . absorbs damaging, mud-pulsation vibration . . spring-steel coil construction prevents hose collapse.

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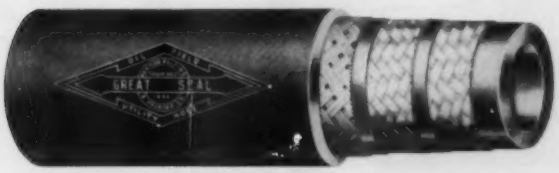
. . the industry's finest . . scientifically embedded reinforcing wires greatly extend hose life . . flexible . . high resistance to kinking. Conforms with or exceeds API standards.



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. . super strong . . super safe . . easily installed by one man in same time formerly taken by entire crew.

Equip your rig with this dependable line of hose . . always available through your Continental-Emsco store or representative.

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Powersteel

MEETS THE STRESSES OF MODERN DAY DRILLING

The extremely high tensile strength of POWERSTEEL makes it perfect for the increased horsepower applied to rigs for deeper drilling.
And it has the fatigue-resisting qualities necessary to take the shocks and wear of faster drawworks speeds.

All this adds up to a stronger, tougher, longer wearing line that helps you drill faster, deeper . . at a lower final wire line cost with POWERSTEEL.

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when you standardize on Yellow Strand POWERSTEEL, you are sure of an adequate supply throughout the Drilling World . . through your Continental-Emsco store or representative.

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Safe and Sure

WITH NEW BEDFORD CORDAGE

Here's a real tough, *hard working* rope. One that crews have learned to rely on for dependable service and long life in every use.

New Bedford Manila is treated to resist water and oil absorption, rot and mildew. Lubrication reduces internal friction and gives longer useful service.

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at no extra cost . . outfit your rig with New Bedford Manila rope . . the finest in the oilfields . . from Continental-Emsco.

e that Sings . .

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Throughout the world, wherever there is oil to drill for.. produce.. transport.. refine.. Continental-Emsco is there to make your job easier with equipment and service of the highest quality possible. C-E's *on-the-spot* application analysis, operational instruction, service and emergency spare parts are yours in the major oil fields of the world.

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when you go WORLDWIDE.. go CONTINENTAL-EMSCO for unequalled equipment. unexcelled service.

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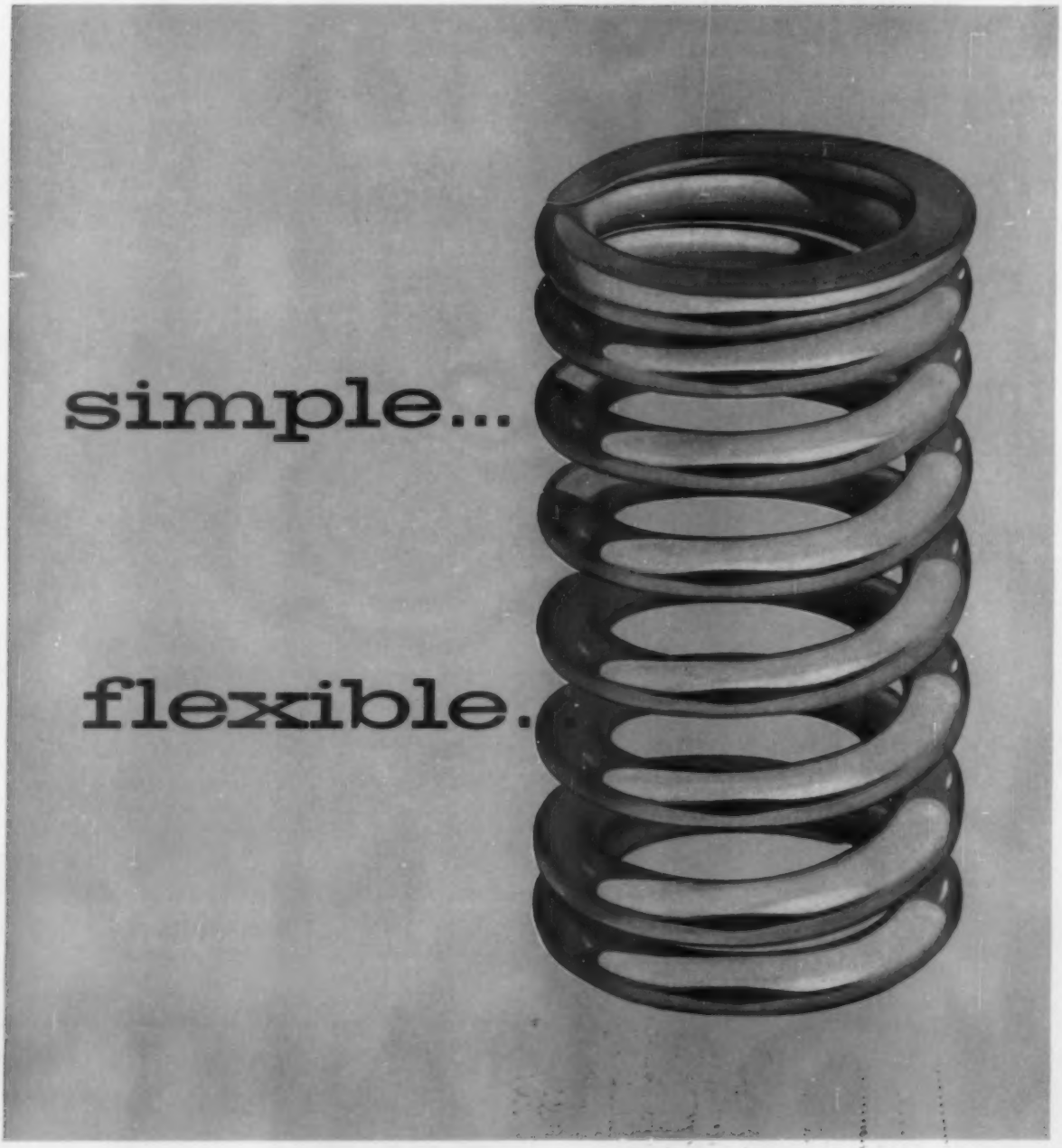

Refiners around the world are profitably using simple, flexible HOUDRIFORMING to obtain maximum yields of high octane gasoline and aromatics.

The ISO-PLUS Process combines HOUDRIFORMING with either aromatics extraction or with thermal reforming to produce super-fuels beyond the reach of single-pass catalytic reforming. For more than a year ISO-PLUS HOUDRIFORMING has been in commercial operation.

With either process, the superior activity and stability of Houdry Type 3-D Platinum Catalyst lowers catalyst cost per barrel throughput.

Investigate the advantages HOUDRIFORMING, ISO-PLUS HOUDRIFORMING, and Houdry Platinum Catalyst may have for you.

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PROCESSES
*Houdry means Progress . . . through Catalysis

HOUDRY PROCESS CORPORATION, 1528 WALNUT STREET, PHILADELPHIA 2, PA.

WHEN COMPLETED, this new 28½-million-dollar petrochemical plant of Imperial Oil, Ltd., at Sarnia, Ont., will produce ethylene, propylene, butylenes, butadiene, aromatic distillates, and tar.

Canada's refining capacity soars

". . . and it looks as if the market might well be there when the new capacity comes on stream."

BY JOHN P. O'DONNELL
District Editor

CANADA'S refining industry either doesn't know there's been a recession or is blithely ignoring it. With a half dozen new refineries building or planned and existing ones being enlarged, the country's capacity to process crude oil will be increased by nearly a third in the next few years. An increase of that magnitude in the face of recent conditions looks questionable.

It may not, however, be as extravagant as it appears. In the first place, demand for petroleum products in Canada is going to increase. The postwar rate of around 10% per year cannot be expected to continue but demand will keep on going up. And, as it goes up, more capacity will be needed to produce more products.

There are other good reasons for Canadian refining capacity to grow:

- Canada still imports substantial quantities of refined products despite the rapidity of oil development within the country. These needs could just as well be supplied by Canadian refineries.
- Distribution patterns are changing. Several refining-deficit areas will have new or expanded capacity which will be geared, in a large measure, to local needs.
- Canada has a fast-growing petrochemical industry which will take more and more of what were once known as refinery byproducts.

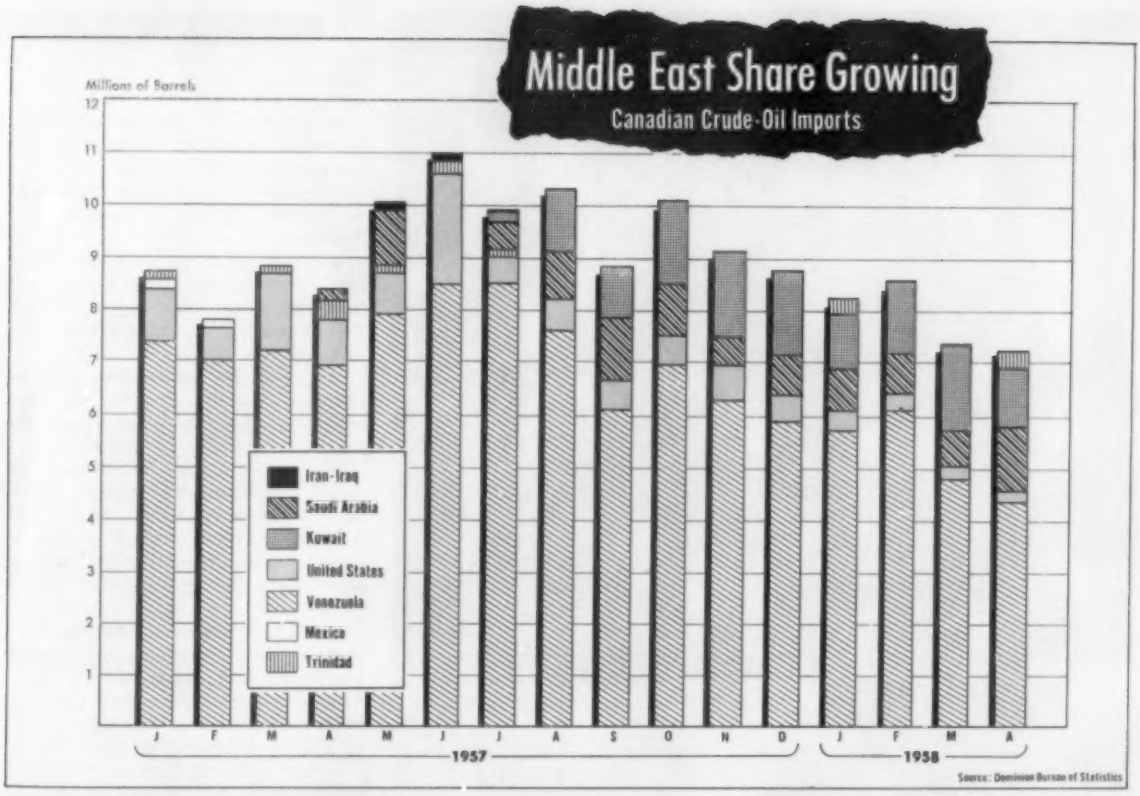
Thus, with a growing national demand, displacement of exports, building in refinery-short areas, and burgeoning petrochemical needs, it looks as if the market might well be there when the new capacity comes on stream.

There is no question about the slowdown in the upward surge in Canada's economy. And it has been a surge. The Canadian industrial production index rose from 200 in January of 1950 to 292 in February of 1957. That's a gain of 46% in 7 years. It slipped later in 1957 but resumed its upward trend early this year.

Demand will grow . . . Demand for crude oil and products, like industrial production, was disappointing in 1957. It is calculated at 745,000 bbl. per day, somewhat less than anticipated. The slump carried over in the first part of 1958 but by midyear it seemed well on its way out. Industry economists then, despite the bad first quarter, envisioned a national demand about 4% above the level of 1957. That would put total 1958 demand around 775,000 bbl. They are equally confident that it will reach 1,000,000 bbl. per day in the early '60's.

Demand for refined products will grow, too, as imports are displaced. These imports represent a substantial share of Canada's requirements. With most of a big continent between the country's major oil-consuming and oil-producing areas, the former have depended a lot on imported products as well as imported crudes.

From a volume standpoint, most important of the imported products is fuel oil. Imports last year represented about 14.5% of the demand for light fuel oil and about 17.5% of the demand for heavy fuel oil. Fuel oil, No. 2 to No. 6, enjoys a greater demand in Canada than any other petroleum product. It would take about a 15% increase in refining capacity to make up the deficit



WITH DOMESTIC CRUDE SUPPLIES steadily increasing, Canadian refiners are less dependent on imports. Imports from the United States, once an important factor in Canadian oil economy, are now of little significance.

if imports of fuel oil were to be replaced entirely.

The wisdom of expanding refining capacity only to meet fuel-oil demands would be questionable because of one thing: natural gas is cheap and increasingly available. The wellhead price of gas is but a fraction of the price of crude oil and, with the opening of the 2,250-mile Trans-Canada line to Montreal, it becomes available in markets now served by fuel oil. Gas may or may not displace fuel oil but, at least, it will supply demands that would otherwise be met by fuel oil. Canada's gas distributors are planning a strong promotion campaign this fall for that very purpose.

While there may be some question of the advisability of increasing refining capacity to meet fuel-oil needs, there is no question about other products. Last year's imports, according to the Canadian Bureau of Statistics, were equal to 7.5% of diesel-fuel demand, 30% of the kerosine demand, 37% of the lube-oil demand, and 97% of the avgas demand. Only in motor gasoline, where they represented less than 3% of demand, were imports a relatively unimportant factor.

Thus, there is a ready-made market for quite a bit more products refined in Canada.

Refining Capacities Growing

There is a considerable change going on in refining within Canada, too. One example is the increase in capacity scheduled in the Toronto area. With three new refineries planned or building and others being expanded, this region may, in time, surpass Montreal as Canada's premier refining area.

Another example is the refinery which Irving Oil Co., in cooperation with Standard Oil Co. of California, is building at St. John's, N. B. This will be the first major refinery in the Province of New Brunswick and the second in the Maritimes. The other is the Imperial Oil Co., Ltd., 44,500-bbl. per day refinery at Halifax, N. S.

The St. John's refinery will have a capacity of 40,000 bbl. per day which makes it the largest of the new or projected refineries. It will cost $45,000,000. Its facilities will include a fluid catalytic cracking unit which will process 9,500 bbl. per day of fresh feed and 3,800 bbl. per day of recycle, a 7,150-bbl. per day catalytic reforming unit, hydrodesulfurization units, a gas-recovery system, and a hydrogen-manufacturing unit.

Several features will distinguish the new refinery:

Because of the markets it will serve, it will be designed for maximum production of heating oil, stove oil, and diesel fuel instead of maximum gasoline yield as is general today.

This will require hydrogenating some of the gas-oil cuts. In order to meet the hydrogen requirements, the refinery will be one of the first to manufacture hydrogen. It will produce 3,000 M.c.f. per day to meet the otherwise unsatisfied needs of the 5,000 bbl. per day unit for treating heavy stove oil, No. 2 fuel oil and diesel oil, and the 2,500-bbl. per day unit for treating intermediate catalytic cycle oil.

Its dock from which incoming crude will be piped to a 50-tank farm, will have to accommodate tankers on a tide that fluctuates as much as 28 ft. St. John's is on the Bay of Fundy which has the world's highest tides.

The refinery will process crudes from Iran and Saudi Arabia. Products will be distributed through more than 1,000 service stations in the Maritimes, 450 service stations in Quebec, and other outlets which Irving Oil now serves.

Other new refineries . . . British American Oil Co., Ltd., at Port Moody, B. C. This 20,000-bbl. per

DU PONT *Petroleum Chemicals* NEWS

Number 90 in a Series of Bulletins for the Petroleum Industry

AUGUST 1958

Demand for continuous on-stream blending prompts this Du Pont service

It used to be a simple matter to blend a little casinghead or cracked gasoline with the straight run from the stills. But today . . .

Every refiner faces the problem of blending from 4 to 10 components into his gasoline from an even greater number of production sources—plus an increasing array of dyes, inhibitors and other additives.

To help you meet this heavy—and rapidly growing heavier—blending load, the Du Pont Petroleum Chemicals Division now offers an impartial consultation service on continuous on-stream blending.

B. G. CRANE (in dark suit) inspects console used in automatically taking tank farm temperatures and gauges. These figures are fed to a computer which automatically converts them to volumes corrected to 60°F. The information is automatically printed three times a day on inventory report forms. Instantaneous gauging information on any tank can be obtained by the operator at the throw of a selector switch.

Trend to automation

The petroleum industry has always been a leader in the trend to automatic processing operations. But one large area left for improvement in product handling is the tank farm and light oil dispatching, blending and loading operations.

"Dacron"*, made in part from oil, serves the well dressed executive

Suits made with Du Pont "Dacron" polyester fiber offer advantages to the businessman. Those to whom neat appearance and comfort are important are broadening the world market for "Dacron". . . and so for petroleum.

The prime quality of "Dacron" (often combined in fabrics with other fibers) is neat appearance. Such fabrics have remarkable *crease-retention* and *resistance to wrinkles.*

Suits made with "Dacron" are easy to care for. All are dry cleanable and many come in wash and wear constructions. Winter weight fabrics are warm, and those for summer are extremely cool.

Chemical companies

Du Pont, manufacturer of "Dacron" and nylon, also an oil derivative, is growing as a consumer of petroleum. So are other chemical companies which make synthetic fibers. As demand for them increases, this market for petroleum will expand.

*"Dacron" is Du Pont's trademark for its polyester fiber.

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

OVER

DUPONT *Petroleum Chemicals* NEWS

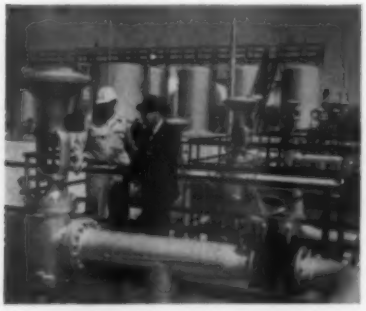
CONTINUED *Continuous Blending*

Now, the adoption of continuous blending of motor fuel is one of the last steps to achieve straight-through handling of all refinery products and elimination of the need for intermediate storage.

What you gain

In comparison with *batch* and *partial* blending methods, the *continuous on-stream* method offers many advantages. Refiners who are now using the automatic continuous method report that they are successfully realizing all, or most, of the following benefits:

1. Increased tank utilization
2. Elimination of reblending
3. Elimination of quality giveaway
4. Reduced loss of light ends
5. Blending closer to ultimate specifications
6. Flexibility in maintaining inventory in base stocks
7. Lower power costs
8. Reduced inventory of TEL and other additives in finished gasoline
9. Simplification of butane shrinkage factor
10. Increased safety



RATE CONTROL VALVES in the automatic gasoline-blending manifold and stock solution tanks used for the continuous injection of additives.

To help you

If you are considering setting up either a partially or completely automatic continuous blending procedure at your refinery, we believe it will pay you to consult with Mr. B. Gardner Crane, our Petroleum Chemicals Division authority on continuous blending methods. He has had wide experience in working with a number of refiners on all aspects of continuous blending problems. You'll find his recommendations completely objective and impartial. Your local Petroleum Chemicals Division representative will be glad to make arrangements.

Space platform built with petroleum-based products predicted for future

A DRAMATIC EXAMPLE of exciting future uses of petroleum-based products developed by the chemical industry is this proposed space platform.

Rocket expert Dr. Wernher von Braun predicts that 1980 will see the first space platform built to accommodate scientific research installations.

Oil in space

Such a platform would probably be built of the same durable, economical petroleum products that are revolutionizing modern housing. The structure would be prefabricated on the ground, of oil-derived materials of plastic or rubberized nylon. The parts would then be shipped in cargo rockets into their orbit, put together, and inflated with internal pressure.

Du Pont warehouses meet emergency additives needs of "caught-short" refiners

When fire broke out recently at a mid-continent refinery, an alert Du Pont representative rushed to the scene to offer whatever assistance he could. He found that the blaze had consumed the refinery's entire stock of additives.

He phoned a nearby Du Pont warehouse, and within a few hours a new supply of additives was on the way by train, arriving next morning.

In another instance, a refinery unexpectedly ran low on gasoline dye. A rush order was phoned to a Du Pont regional office at 1 p.m. The dye was shipped from a nearby Du Pont warehouse the same afternoon. In spite of a nine-inch snowfall which blanketed the route, the truck delivered the dye before the refinery's dwindling supply ran out.

These are only two of many examples of how our well stocked, conveniently located warehouses can help you solve an additives shortage. There are seven warehouses: at Carneys Point, New Jersey; East Chicago, Indiana; Kansas City, Missouri; La Porte, Texas; Billings, Montana; Mt. Vernon, Washington; and Los Angeles, California. Each maintains an ample supply of Du Pont additives, including Du Pont Metal Deactivator, antioxidants, dyes, fuel oil additives, and grease stabilizers.

For these or similar Du Pont services, contact the nearest office in this list:

SALES OFFICES

Chicago 3—8 So. Michigan Ave. . . . RAndolph 6-8630
Cleveland 15—25 Prospect Ave. . . . SUperior 1-1363
Houston 2—
705 Bank of Commerce Bldg. . . . . CApitol 5-1151
Los Angeles 17—612 So. Flower St. . MAdison 4-1354
New York 20—
45 Rockefeller Plaza . . . . . COlumbus 5-2342
Philadelphia 2—3 Penn Center Plaza . LOcust 8-3531
Pittsburgh 22—1 Gateway Center . . . ATlantic 1-2933
San Francisco 4—111 Sutter St. . . . EXbrook 2-1934
Seattle 3—4003 Aurora Ave. . . . . MElrose 2-6977
Tulsa 1—1811 So. Baltimore Ave. . . . . LUther 5-5578
In Canada—Du Pont Company of Canada (1956) Limited, Petroleum Chemicals, 85 Eglinton Ave. East, Toronto 12—Ontario . . . . . HUdson 1-6461
In Other Countries—Organic Chemicals Department, Export Division, 7447 Nemours Bldg., Wilmington 98, Del., PRospect 4-2962.

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. . . through Chemistry

Du Pont Tetraethyl Lead and other Petroleum Additives

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

OVER

A-7352

Printed in U. S. A.

OCTANE ratings of Canadian motor fuels have advanced to levels prevailing in the United States.

day plant is scheduled for completion this September. Its equipment will include a 9,000-bbl. per day vacuum unit, a 13,500-bbl. per day fluid catalytic cracker operating on 33% recycle, a 4,000 bbl. per day Atlantic catformer, a 1,000-bbl. per day sulfuric acid alkylation unit, and a 7,200-bbl. per day hydrogen-treating unit.

Cities Service Oil Co., Ltd., at Bronte, Ont., will also be a 20,000-bbl. per day plant and will have a 7,600-bbl. per day vacuum unit, a 13,000-bbl. per day UOP catalytic cracking unit, and a 3,110-bbl. per day Sinclair-Baker-Kellogg catalytic reformer. This plant is scheduled to go on stream next year.

British Petroleum Co. of Canada, Ltd., at Ville d'Anjou, Que., will have a crude capacity of 30,000 bbl. per day and is scheduled for completion in mid-1960. It will have 30,000 bbl. per day of catalytic cracking capacity and 9,000 bbl. per day catalytic reforming capacity.

Shell Oil Co. of Canada, Ltd., is scheduled to complete construction of a 20,000-bbl. per day refinery at Bronte, Ont., in 1960.

Canadian Petrofina, which is increasing the capacity of its Montreal refinery, has disclosed plans for the contsruction of a new one in Ontario. It is tentatively scheduled to go on stream in 1961-62.

In addition to these, Pacific Petroleums, Ltd., and Phillips Petroleum Co. have announced plans for a jointly owned refinery at Taylor, B. C., which Pacific would operate; Excelsior Refineries, Ltd., have disclosed tentative plans for a small refinery at The Pas, Man.

Expansions scheduled . . . Over and above the new construction, there is extensive expansion of existing facilities going. Imperial Oil Co., Ltd., is expanding the crude capacity of its refineries at Sarnia by 15,200 bbl. per day; Calgary by 6,700 bbl. per day, and Vancouver by 7,300 bbl. per day, a total of almost 30,000 bbl. per day of new capacity.

Other notable expansion projects are those of Canadian Oil Companies, Ltd., at Corunna, Ont., 20,000 bbl., and Canadian Petrofina, Ltd., at Montreal, 10,000 bbl.

Improved processing . . . Then there is additional processing equipment going in that will not enlarge the quantity but will improve the quality of product. This includes catalytic cracking, catalytic reforming, and hydrogen-treating units that will enable Canadian refineries to produce higher-quality motor gasoline and distillates. Shell is adding an alkylation unit at Montreal to enable it to produce aviation gasoline and Imperial will begin the production of asphalt at Edmonton in 1959.

This improved processing ability will make it possible for Canadian refiners to keep pace in the octane race. And it is a race. In May of this year, the all-Canada average for

CANADIAN CAPACITY SHORT OF DEMAND

	Refinery prod. (bbl.*)	Domestic demand (bbl.)	Domestic deficit (bbl.)	Imports (bbl.)	Imports—% of demand
Liquefied petroleum gas	2,938,132	4,128,609	1,190,477	1,220,454	29.56
Petrochem. feed stock	3,572,881	2,990,574	(582,307)		
Naphtha specialties	1,014,907	1,384,627	369,720	388,206	28.04
Aviation gasoline	672,712	3,586,391	2,913,679	3,251,137	90.65
Motor gasoline	87,703,951	89,160,192	1,456,241	2,550,143	2.86
Aviation turbofuel	4,707,090	3,498,092	(1,208,998)	9,751	0.28
Kerosine, stove oil	12,845,448	14,865,224	2,019,776	4,454,815	29.97
Diesel fuel	24,912,590	20,945,593	(3,966,997)	1,537,853	7.37
Light fuel oil	37,212,612	49,245,136	12,032,524	7,198,089	14.62
Heavy fuel oil	46,411,574	55,884,003	9,472,429	9,705,664	17.36
Asphalt	8,702,866	8,052,626	(650,240)	158,838	1.97
Coke	2,153,440	3,987,725	1,834,285	2,048,871	51.34
Lube oil and greases	2,108,728	3,171,809	1,063,081	1,176,813	37.10
Wax	154,709	295,995	141,286	150,687	50.91
Other products	525,550	1,308,792	783,242	535,962	40.95
Total	235,637,190	262,505,388	26,868,198	34,387,283	13.91

Source: Dominion Bureau of Statistics, Refined Petroleum Products, 1957. *Barrel = 35 imperial gallons.

CANADA—GOOD U. S. OIL CUSTOMER

U. S. exports, 1957—*	To all countries		To Canada		% of vol. to Canada
	Vol. (bbl.)	Value ($)	Vol. (bbl.)	Value ($)	
Motor fuel	12,613,774	64,248,505	603,071	3,699,388	4.78
Naphtha	1,284,672	13,545,128	676,085	5,786,981	52.63
Kerosine	4,914,252	21,779,707	237,105	2,063,691	4.82
Gas-oil and distillates	45,070,782	182,162,958	5,236,373	23,025,628	11.62
Residual fuel oil	32,875,492	95,951,054	5,918,040	17,378,029	18.00
Lube oil	15,738,944	183,678,320	1,884,461	11,909,279	11.09
Unfinished oil	506,204	288,156	38,569	190,797	7.62
Blending agents	1,931,524	14,530,553	82,108	765,015	4.25
Avgas (under 90)	377,553	2,927,101	292,354	2,224,286	77.43
LPG	4,538,165	21,100,385	1,339,855	11,303,845	29.52
Wax (lb.)	286,504,051	22,741,638	36,788,999	2,710,312	12.84
Asphalt (long tons)	250,748	9,991,858	32,195	1,469,009	12.84
Petroleum coke (long tons)	924,288	20,970,289	397,370	6,528,865	42.99
Others	.....	7,044,086	.....	2,588,388	
		660,959,738		91,613,513	

*Source: U. S. Department of Commerce. Figures on exports of aviation fuel over 90 octane are not broken down by countries for security reasons.

premium, according to the Ethyl Corp. survey, was 98.2 road octane number and for regular, 91.6. These compare with U. S. figures for the same month of 98.5 octane and 91.2 octane. Canadian premium was 0.3 octane behind U. S. and its regular 0.4 above U. S. It is obvious that the gap that once existed between Canadian and U. S. gasoline quality is closed.

While improvement in gasoline quality on an octane basis in the U. S. dropped to almost zero in the first half of this year, it was moving ahead at a brisk pace in Canada. In the first 6 months (November 1957 to May 1958) premium had gone up 0.3 octane and regular, 0.7 octane. Compared with a year earlier, premium was up 2.1 octanes and regular, 1.8 octanes.

Quebec is the Canadian equivalent of the U. S. East Coast when it comes to high-quality motor fuel. The Ethyl survey showed premium at 99.1 road octane number and regular at 93.1 in Quebec in May. This compared with 99.1 and 93.0, respectively, for New York City. A factor in the Quebec-Ontario area has been the introduction by Sun Oil Co. of its multigrade blending units at 750 stations in the two provinces. This undertaking, making gasoline of from 94 to 102 octane available to motorists, was completed in June, well ahead of schedule.

Petrochemicals Booming

Canada's petrochemical industry is young but is growing fast. It will get a tremendous impetus this summer and fall when Imperial Oil Co., Ltd., starts up its new $28,500,000 complex at Sarnia. The first units are scheduled to go on stream in August and the entire plant is expected to be in operation by October. Its principal products will be ethylene, propylene, butylenes, and butadienes. Charging stock for the new plant, around 10,000 bbl. per day, will come from the adjacent Imperial refinery.

Other petrochemical developments include the following:

Shell Oil Co. of Canada is installing facilities at its Montreal East refinery for the production of epoxy-type resins, the first Canadian plant for this purpose, and alkylation capacity for making detergent and motor fuel alkylate. Last year it added methyl ethyl ketone and secondary butyl alcohol units at Montreal East.

Canadian Oil Companies, Ltd., recently completed facilities at its Sarnia refinery for the recovery of benzene, toluene, and xylene. The cost is estimated at $30,000,000.

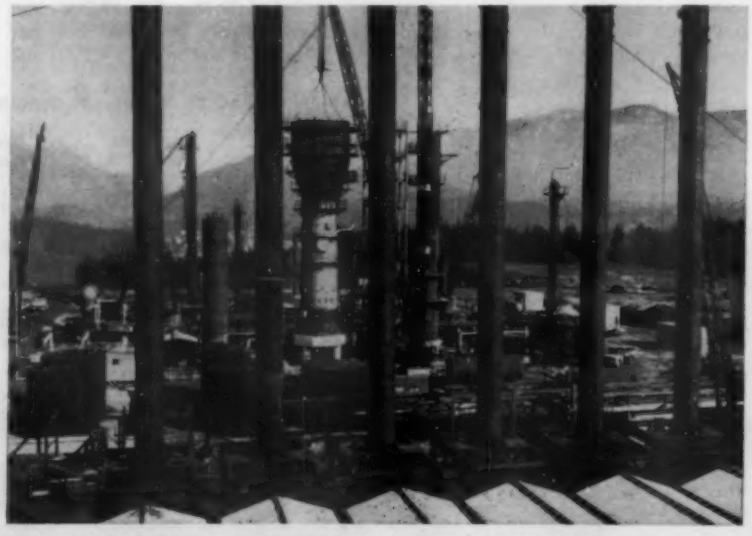
Polymer Corp. is adding a latex plant and is expanding its butadiene and rubber-finishing capacity. Polymer has doubled capacity of its Sarnia plant in the last few years and now has a rated capacity of 130,000 tons of synthetic rubber per year.

Canadian Industries is expanding its polyethylene-producing facilities at Edmonton. When completed next year, this plant will have a capacity of 40,000 lb. per year. Canadian Industries is also producing anhydrous ammonia.

Union Carbide of Canada completed polyethylene facilities in Montreal East a year ago and is now engaged in its second expansion, a project due for completion next year.

Dow Chemical completed ethylene facilities at its Sarnia plant last year and polystyrene facilities this year.

Du Pont of Canada has disclosed plans for erecting a linear polyethylene plant at Sarnia.



NEW 20,000-bbl.-daily refinery of British American Oil Co. is nearing completion at Port Moody, near Vancouver, B. C. Plant is scheduled to go on operation in October.

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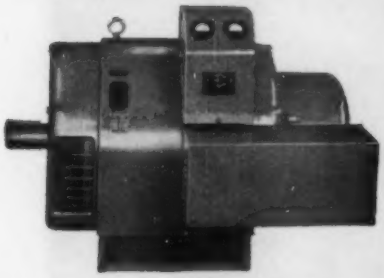
AMP-PAK



AMP-PAK Generator shown is rated at 187 kva, 1200 rpm, 240/480 volts. AMP-PAK is available in ratings of 75 thru 187 kva at 1800 rpm and 62½ thru 187 kva at 1200 rpm. Three phase, 80% PF, 60 cycles, 50C rise, and 120/208, 240 and 480 volts.

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No rotating exciter to maintain. D-C excitation is provided by a heavy duty, long-life, static rectifier.

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Holds voltage "rock-steady" so your motors, lights, and electronic equipment will work better. The static regulator provides ±2% regulation.

Starts big motors. A special, built-in voltage booster transformer stands by to reinforce line voltage when heavy loads are suddenly applied.

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DRILLING Holes are punched into granite which lies beneath the surface in Ontario.

LOADING Sticks of dynamite are loaded into holes and connected with primacord.

Trans-Canada Pipeline nears completion

Gas scheduled to reach Montreal burner tips in November

BY GENE KINNEY
Assistant Pipeline Editor

THE CANADIAN DREAM of a natural-gas pipeline from the great Alberta gas fields to eastern population centers is nearing realization. Contractors are welding together the final 853 miles of 30-in. in Ontario which will complete the 2,300-mile system.

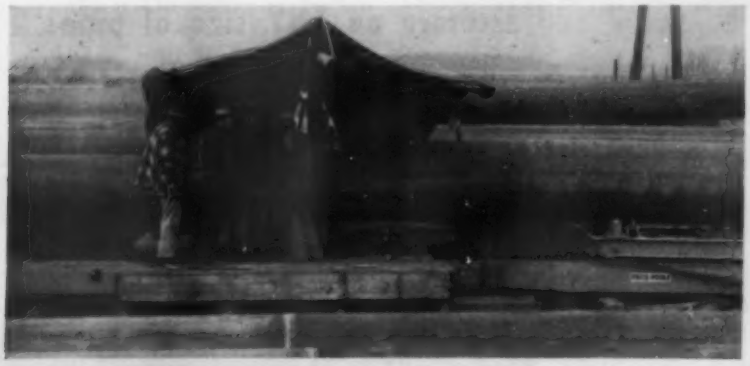
Sometime in November, Alberta gas will reach burner tips in Montreal, climaxing a struggle begun in 1950 by Western Pipe Lines and taken up in 1954 by Trans-Canada Pipe Lines, Ltd., Western's successor.

Trans-Canada has since survived several crises. Initial money problems were solved by a government loan (since repaid) to start construction and government underwriting of a 675-mile section through a sparsely settled part of Ontario. Trans-Canada weathered a political storm in parliament. It has overcome delays, such as the steel strike which prevented completion of the western leg in 1956. It has emerged as a Canadian-controlled project, with major interests being relinquished by American firms who achieved their goal of getting the line under way. It has received a vote of confidence from investors and will start operations without the market once considered essential to its feasibility—the export of 204,000 M.c.f. daily into the U. S. Midwest.

Toronto has been receiving natural gas from the United States since 1954 through a 76-mile, 20-in. line from Niagara Falls. Alberta gas began flowing last winter along the line across Saskatchewan, Manitoba, and Ontario to Port Arthur. Deliveries were made to Ottawa and Montreal with gas borrowed from Union Gas Co. of Canada, Ltd., in Ontario, permitting a market buildup and distribution-line construction in advance of the arrival of Alberta gas this fall.

As the 378 million-dollar line nears completion, its growth prospects are the best ever. Increased demand has resulted in construction this year of six compressor stations totaling 48,500 hp., which is 20,800 hp. over what was originally planned for 1956. Deliveries for the 1958-59 heating season are expected to reach 300,000 M.c.f. daily, up sharply from the 67,000 M.c.f. daily last year from Alberta.

Trans-Canada expects to be transporting at the end of the third year of operation up to 800,000 M.c.f.



DOUBLE JOINTING with automatic welding unit speeds construction.

BLASTING Charges are detonated, ripping a ditch for backhoes to clean out on Price-Poole spread.

daily, a volume anticipated at the end of the fifth year. The company still looks forward to a favorable decision from the Borden Commission and the Federal Power Commission permitting early export of gas at Emerson, Man., where it would connect with the proposed Midwestern Gas Transmission Co.

Trans-Canada's announced maximum-day requirements, not counting the possible U. S. sales, are projected to 1,022,812 M.c.f. in 1965, 2,509,090 in 1975, and 3,496,585 in 1987.

The unexpectedly rapid market growth in Canada has changed the financial outlook considerably. Trans-Canada has announced plans for purchase ahead of schedule of the Ontario section built by Northern Ontario Pipe Line Crown Corp., owned by the Ontario and dominion governments and leased to Trans-Canada.

An All-Canadian Line

Government backing made possible routing the line through the bleak, rough, and relatively undeveloped north country, instead of through the United States, and preserved Trans-Canada as an all-Canadian line. Furthermore, this decision, whose wisdom was loudly questioned, now is hailed for opening up markets initially much larger than expected and potentially among Canada's largest.

At the end of last year, Trans-Canada had completed the 574-mile, 34-in. section from Burstall, Sask., on the Alberta border, to Winnipeg, 390 miles of 30-in. from Winnipeg to Port Arthur, and 310 miles of 20-in. from Toronto to Montreal.

Twelve contractors are working on the 30-in. main line from Port Arthur to Maple, near Toronto. They left the worst till last on this job. The route makes nine major river crossings and cuts through heavy timber, muskeg, and granite before giving way to rolling hills and farmland towards Toronto. The 1958 construction will cost $165 million dollars. Costs on the roughest section will exceed $16 a foot, several times the successful bid for the larger 34-in. pipe on the prairies.

The ditch is being blasted over much of the 853 miles. Pneumatic drills punch 7 to 8-in. holes in the granite for blasting with dynamite or ammonium nitrate fertilizer mixed with fuel oil. The fertilizer-oil combination has recently found application as an economical and safe explosive for pipeline construction.

Blasting was also required to cut a ditch in the beds of several lakes and streams. Only dynamite was used in this instance. Where possible crossings were shot before the spring thaw. In lakes which had ice thick enough to support heavy equipment, blasting holes were drilled through the ice and loaded through casings. At swift streams where only a thin coat of ice formed, drilling and cleanout work was done from barges.

All preliminary work possible, such as stringing and right-of-way clearing, was started in zero winter weather to permit crews to take maximum advantage of the short season of good construction weather.

Beefed-up spreads and slow if steady progress are earmarks of most of the Ontario construction. This final leg is taxing the skill of many of the world's best pipeliners. But with all the obstacles, the Ontario gap will soon be bridged. Completion of the line will be the occasion for a national celebration of one of the more significant events in Canada's economic history.

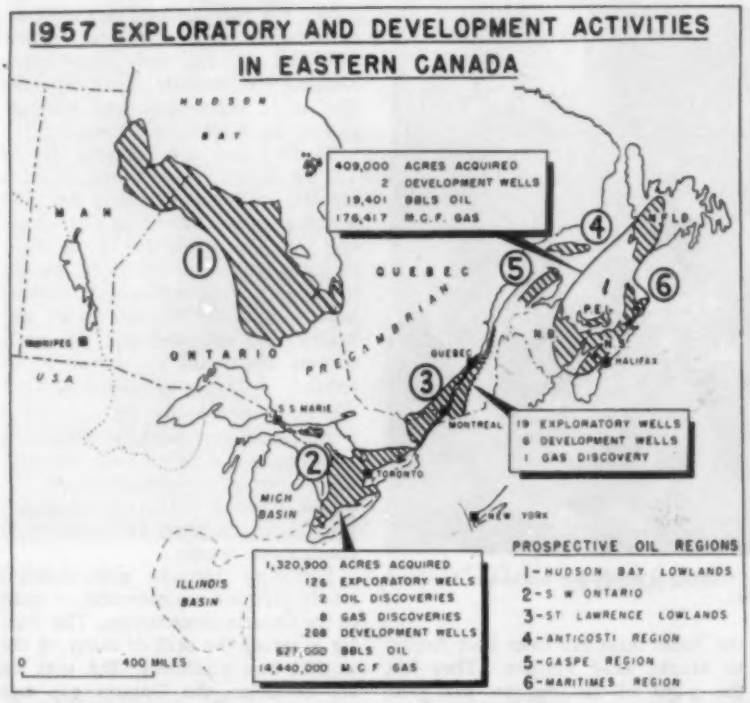
Alberta Gas Trunk Line Co., Ltd., will have the gathering system ready, too. Supply laterals are being extended to connect Sibbald, Oyen, Cessford, Sunnybrook, Princess-Patricia, Atlee-Buffalo, and Pincher Creek fields. Provost and Bindloss fields supplied first-year requirements.

TRANS-CANADA'S 1958 CONSTRUCTION

Contractor—	Mileage	Location
Nelen Ltd. & Associates	63	Port Arthur-Nipigon River
Morrison-Shivers, Ltd.	48	Nipigon River-Beardmore
Majestic Contractors, Ltd.	71	Beardmore-Long Lac
B. C. Rivers Const., Ltd.	91	Long Lac-Shekak River
Mannix Co., Ltd.	92	Shekak River-Kapuskasing
Gray Constructors Canadian, Ltd	82	Kapuskasing-Potter
Majestic Contractors, Ltd.	83	Potter-Kirkland Lake
Dutton-Williams Brothers	57	Kirkland Lake-Rib Lake
Canadian Bechtel, Ltd.	47	Rib Lake-Tilden Lake
Morrison-Shivers, Ltd.	62	Tilden Lake-South River
Price-Poole Constructors	62	Tilden Lake-South River
Oklahoma Constructors, Ltd.	92	Bracebridge-Maple

1958 COMPRESSOR-STATION INSTALLATION

Location—	Horsepower	Contractor
Burstall, Sask.	10,200	Dutton-Williams Brothers
Caron, Sask.	10,200	Marwell Construction Co.
Moosomin, Sask.	10,200	Brown & Root, Fraser-Brace Engineering
Winnipeg, Man.	7,500	Poole-Pritchard, Ltd.
Port Arthur, Ont.	5,000	Salem Engineering
North Bay, Ont.	5,400	Fluor Corp. of Canada



GAS EXPLORATION and subsequent development, as in the past, led drilling activity in eastern Canada. Offshore leasing in Lake Erie saw permits go out for 1 million acres.

Eastern Canada bids for share of spotlight

Interest in the area is at an all-time high, with 78 companies having land holdings. Of these, 36 are participating in Lake Erie offshore acreage.

IN southwestern Ontario during 1957, both development and exploratory drilling remained about the same as in 1956. Production of oil increased 5% over the previous year to 627,000 bbl., and natural gas increased 11%, totaling 14,440 M.M.c.f. There were three significant discoveries, all in Kent County. A notable trend in southwestern Ontario was the issuing of permits exceeding 1,000,000 acres of offshore acreage on Lake Erie.

In the St. Lawrence lowlands of Quebec exploratory drilling increased 54% over 1956, and what appears to be a one-well gas pool was discovered in the Trenton rocks of Ordovician age, 20 miles northeast of the city of Three Rivers.

Perhaps at no time in the exploratory history of the oil and gas industry in eastern Canada has there been more active interest in this area as a whole (Fig. 1). Approximately 78 companies have land holdings in eastern Canada. Of this number, 65 hold land in Ontario, 36 of which are exclusively participating in offshore acreage on the Great Lakes.

This is an abridged version of "Developments in Eastern Canada in 1957," by J. D. McAlary and B. V. Sanford, in AAPG Bulletin, June 1958.

Development Activities

Southwestern Ontario . . . During 1957 there were 288 development wells completed in southwestern Ontario, 198 of which were successful. The areas are indicated on Fig. 2.

Of the 34 successful Devonian development oil wells, 23 were drilled within the boundaries of the Rodney field and these had an average initial flow of 20 bbl. per day, with drilling depths up to 400 ft.

Development drilling in the Salina-Guelph of Silurian age resulted in 10 oil wells and 25 gas wells being completed, with average initial productions of 22 bbl. and 1,700 M.c.f.d., respectively. Most of these wells were completed in Lambton and Kent counties and in the offshore region of Lake Erie south of Kent County.

In the eastern part of the peninsula, 126 successful development gas wells were the result of testing the Clinton-Medina of Silurian age, and these had an average initial open flow of 79 M.c.f.d. Seventy per cent of these wells were in Norfolk County (Fig. 2).

Three successful Trenton - Black River (Ordovician age) development completions were made during 1957, one on Manitoulin Island and two in Halton County near Toronto, the latter having average initial open flows exceeding 500 M.c.f.d.

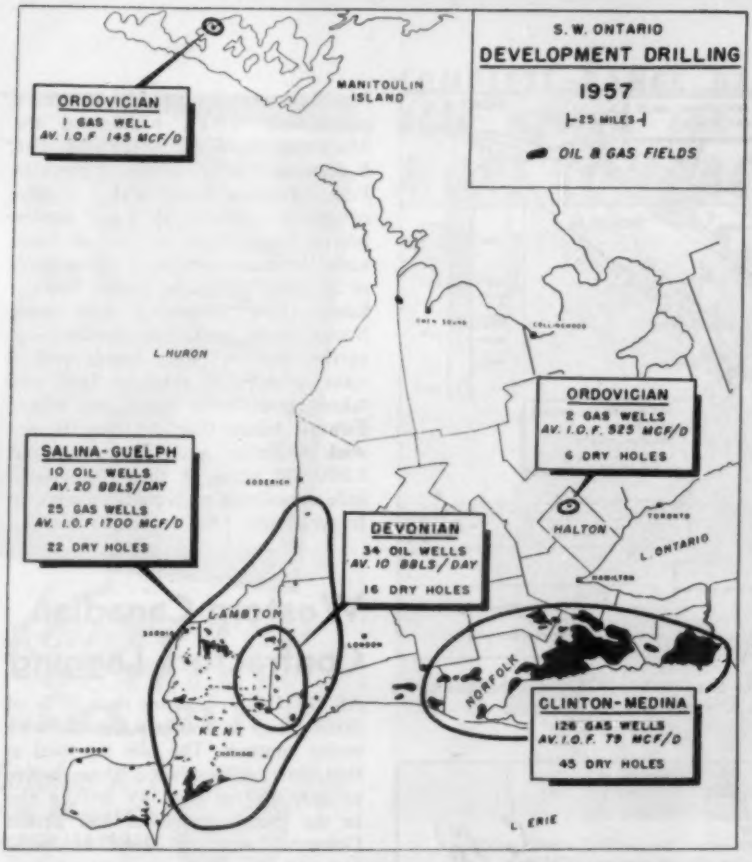
St. Lawrence lowlands . . . During 1957 six development wells were drilled in the St. Lawrence lowlands of Quebec. Four of these were drilled in connection with a reported discovery in 1956 in the Assumption area (Fig. 4). The results of these tests are somewhat inconclusive, though all of these wells had interesting gas shows at approximately the same stratigraphic horizon as the discovery.

From present information, it appears that the reservoiring of gas is due to fracture conditions in the upper Trenton rocks of Ordovician age which consist of dense limestones. Several flow tests have been run on these wells, but there are insufficient data to assess the true potentiality of this field. The other two development wells were drilled as offsets to the Batiscan discovery well (Fig. 4) and both were dry holes. These wells penetrated the middle Trenton rocks, which, with two dry exploratory tests into the Cambrian rocks in this locality, restricted somewhat the productive area of this discovery.

New Brunswick . . . Two development wells were drilled the past year in the Stony Creek oil and gas field. One of these was successful, having an initial open flow of 200 M.c.f.d. from sands of lower Mississippian age.

Exploratory Activities

Southwestern Ontario . . . There were 126 exploratory wells completed in



FIELD-DEVELOPMENT DRILLING netted 288 well completions of which 198 were successful in southwestern Ontario in 1957.

southwestern Ontario during 1957. Much of the exploratory activity as in previous years was confined to Essex, Kent, Lambton, and Huron counties, as well as in the offshore area in the western part of Lake Erie (Fig. 3). In this area, 64 wells were drilled into the Salina-Guelph of Silurian age, 6 of which were successful in finding new accumulations of gas and one oil pool. Of the 12 exploratory wells drilled offshore in Lake Erie, one resulted in a gas discovery with an initial open flow of 937 M.c.f.d.

Five wells were drilled as exploratory tests in the Clinton-Medina of Silurian age in Norfolk County and two of these were completed as successful gas wells.

There were 21 deep wells drilled during the year, which either reached the Ordovician strata or completely penetrated this system. Of these deeper tests, one resulted in an oil discovery in Kent County. Although initial production was small (5 bbl. per day), this well was significant in that it revived interest in the deeper formations which have been discouraging in the past. Increased activity on Manitoulin Island resulted in the completion of 10 Cambrian - Ordovician tests.

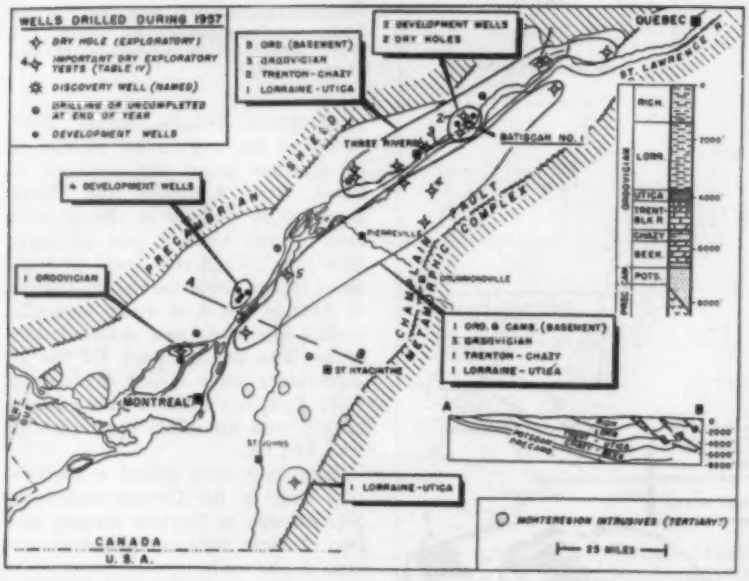
During 1957 approximately 1,320,000 acres were acquired, of which 1,120,890 were offshore permits.

There were 34 crew-months of gravity surveys last year, 20 of which were under water.

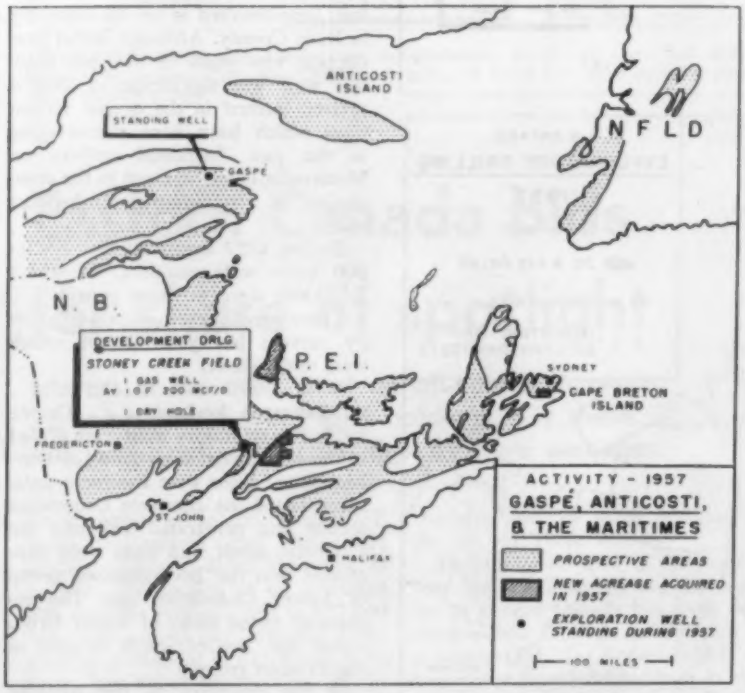
St. Lawrence lowlands . . . During 1957, 19 exploratory wells were drilled in the St. Lawrence lowlands of Quebec. Six of these were basement tests, seven tested the complete Ordovician section and penetrated well into the Cambrian sands, and three wells penetrated into the Beekmantown group of Lower Ordovician age. The remainder tested rocks of Upper Ordovician age, two of which stopped in the Trenton group.

A gas discovery in the Batiscan area, 20 miles northeast of Three Rivers (Fig. 4) found the pay zone in finely crystalline to slightly fragmented limestones of the Trenton group of Ordovician age. This well gave an initial open flow of 3,500 M.c.f.d., with a closed - in pressure of 960 psi. The followup wells failed

SOUTHWESTERN ONTARIO saw 126 wildcats completed last year. Deep wells drilled during the year totaled 21.



BIG EXPLORATORY ITEM in the St. Lawrence Lowlands in 1957 was the gas strike near Batiscan, 20 miles northeast of Three Rivers.



VERY LITTLE DRILLING was done in the Maritimes last year, but an active geophysical program was reported.

to increase the areal extent of the discovery.

There was very little change in the amount of acreage acquired or given up during the year.

At the end of the year, seven wells were drilling or standing awaiting further tests.

During the past year, approximately seven crew-months of gravity work were done in the Quebec lowlands and 22 structure test wells were drilled.

Gaspe . . . In the Gaspe area, 8 party-months of field geological studies were carried out during the summer months.

Maritimes region . . . Fairly extensive geophysical work highlighted the Maritimes region during the year, with 8 crew-months of seismic surveys in Prince Edward Island and 2 months of gravity surveys in Cape Breton Island, Nova Scotia, as well as some aerial magnetometer work across parts of all three provinces, Prince Edward Island, New Brunswick, and Nova Scotia. Field geological studies were carried out in Nova Scotia and a total of 409,000 acres of land was taken up in Nova Scotia and Prince Edward Island (Fig. 5). New Brunswick Oilfields, Ltd., farmed out 1,000,000 acres of their 10,000-sq.-mile concession in New Brunswick to Imperial Oil, Ltd., for exploration.

Western Canadian Contractors Lagging

AS OF JULY 7, fewer than 50% of drilling rigs in western Canada were under contract. The idle rig total at that time outnumbered those active as only 169 of the 349 drilling rigs in the prairie provinces and British Columbia were at work or being moved to location.

At this time last year there were 304 rigs working in western Canada. At the first of July there were 78 separate drilling firms or oil companies that run their own drilling equipment listed with workable rigs and large and small alike have been hit by the current slump. The score during the first week of July was 125 rigs actually at work, 44 moving to location, and 180 racked. Province distribution shows 244 rigs in Alberta (120 of those at work), 67 in Saskatchewan (32 running), 29 in British Columbia (11 working), 7 in Manitoba (3 drilling). There were two in the Northwest Territories . . . both are shut down.

Some of the top drilling companies with rigs going in the western provinces are:

. . . Commonwealth Drilling Co. with 13 working out of 27 available.

. . . General Petroleums with 12 working out of 20.

. . . Regent Drilling Co., Ltd., with 10 working out of 18.

. . . Cascade Drilling Co., Ltd., with 10 out of 15.

. . . Peter Bawden Drilling Co. with 5 out of 14.

. . . Parker Drilling Co. of Canada with 7 out of 12.

. . . Imperial Oil, Ltd., with 3 out of 12.

. . . Brinkerhoff Drilling Co. with 9 out of 12.

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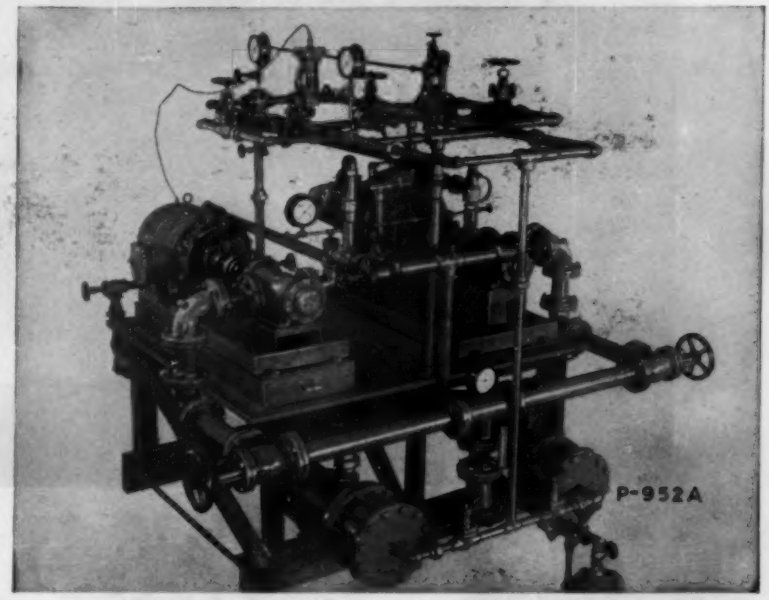

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Blowouts take a fearful toll

Canadian Report

Here's what they have cost Canadian operators in the past 10 years in loss of equipment—and life. They can be prevented—here's how

BY H. DONALD BINNEY, Hi-Tower Drilling Co.

DESPITE THE PROGRESS made in safety, blowouts still plague the Canadian drilling industry. Since March 8, 1948, 32 wells have blown out, or an average of 3.2 wild wells per year. Surprisingly enough the number of blowouts per year has not decreased appreciably. In 1956 and 1957 there were eight wild wells, five in 1956, and three in 1957.

Blowouts have taken a heavy toll during the past 10 years:

- Seven drilling rigs and two service rigs totally destroyed.
- Three drilling rigs partially destroyed.
- Rig loss alone exceeds $2,000,000.

Twelve of the 32 blowouts caught on fire, and this number is directly related to the rigs destroyed. Eighteen of the blowouts occurred while the wells were being completed or on production, and can be traced to various situations. Four of these occurred when no rig was over the hole so do not concern the drilling or service contractor. Here's an analysis of the remaining 14 and the cause of the blowout:

- Lost circulation: eight.
- Swabbing the hole while tripping: four.
- Drill-stem testing: two.

But far more serious than the rig losses and damage to the wells is the fact that three men lost their lives during or after the blowouts occurred. For the safety of the men, if for no other reason, the drilling contractor must take all steps within his power to prevent future blowouts. The result will be time, money, and equipment saved, and more important, prevention of injuries and possibly fatalities.

What causes blowouts? . . . Of the 12 blowouts where the rigs were destroyed, cratering around the surface caused 4. Another four caught fire immediately upon blowing out and could not be controlled. It is significant that 4 of the 12 can be blamed directly upon improper equipment, equipment failure, or human error on the part of the crew. Here are the principal reasons why blowouts were not held under control:

1. Insufficient equipment.
2. Improper installation.
3. Improper or no bleedoff, choke, or kill lines.
4. Improper surface casing and cementing program.
5. Inadequate crew drilling program.

How to Prevent Blowouts

Drilling contractors can help prevent blowouts by concentrating upon three factors:

1. Crew training.
2. Planned operation or drilling program.
3. Proper equipment for the area involved.

Of these factors, crew training is

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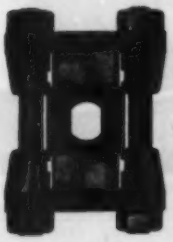

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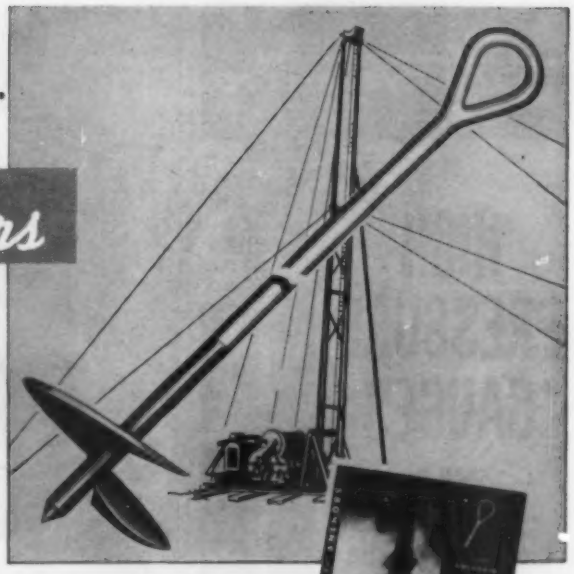

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THE AUTHOR

H. Donald Binney is vice president of operations for Hi-Tower Drilling Co., Calgary. He is a native of Moncton, N. B., and started in the drilling end of the oil business in 1939 with Anglo Canadian Oil Co., Ltd. (Drilling Contractors, Ltd.). He served 3½ years with the Royal Canadian Navy and rejoined Drilling Contractors, Ltd., the predecessor to Hi-Tower Drilling, in 1945.

This paper was presented at the annual Oilwell Drilling Safety Clinic, sponsored by the Canadian Association of Oilwell Drilling Contractors.

the most important and without it, we can accomplish nothing in the way of blowout prevention.

Well hydraulics . . . The first step in training the crew is to instruct them and impress upon them that their best blowout preventer is the fluid column in the hole. If the crew fails to handle its duties with regard to the fluid column, a blowout is a definite possibility. Instruct the crew on the importance of carrying out promptly and accurately all instructions regarding the additions of mud or chemicals to the drilling fluid. The most important part of this phase of crew training is to impress on the crew over and over again the absolute necessity of keeping the hole full at all times, regardless of the operation being performed.

Teach the driller some fundamentals of simple well hydraulics so he knows if he is actually filling the hole, just running the pump, or if the hole is swabbing, or if he is not displacing the right amount of fluid while he is running in. This phase should include a study of hole capacities, pipe capacities and displacement, tank capacities, and how to compute hydrostatic pressures. Both the driller and the tool pusher should know exactly how many inches of fluid from mud tanks will fill the hole for a given amount of pipe removed from the hole, either normally with a bit draining or a wet string such as a tester or a plugged bit. Under the latter conditions, swabbing is most likely to occur.

Install on all rigs, and particularly on wildcats, a remote-reading pit-level indicator. Place this where the driller can see it while he is at the draw-works controls. He can then determine if the hole is taking or displacing the right amount of fluid for the operation in progress.

Place a card on the draw-works panel that contains the pertinent figures and information regarding hole filling for the driller's reference. Instruct the driller on pressure surges to show him the hazards of unnecessary spudding, especially with the pump on. Teach him the danger of lowering the drill pipe or casing too fast; this can break down a formation and cause circulation. The result creates a condition favorable for a blowout as well as bad hole conditions that could stick the drill pipe.

Basic cause of a blowout . . . Whenever the formation pressure is greater than the hydrostatic pressure of the fluid column in the hole, a blowout threatens. This can occur in a number of ways:

1. A reduction in the height of the column and consequently a reduction in weight. This may be due to lost circulation or failure to keep the hole full while tripping.
2. A reduction in static pressure by swabbing the hole when coming out.
3. Encountering an abnormally high-pressure formation, or the mud column is too light for normal pressure formation, or gas cutting has continued for several days.

Here are some of the symptoms of a possible blowout:

1. Mud returning faster than it is being pumped into the hole.
2. Mud returning when pumps are not operating.
3. Rapid increase in penetration rate in lost-circulation areas.
4. Loss of returns or lost circulation.
5. Gas-cut mud.

In Alberta, lost circulation apparently is one of the major causes. Next in line come failure to keep the hole full and swabbing. Surprisingly enough blowouts in high-pressure areas are in the minority.

Impress upon the drilling crew the cost of drilling fluids and emphasize the need for keeping mud costs as low as possible by not wasting or losing these fluids.

Safety . . . Blowout-prevention equipment is heavy and awkward. Moving and handling these pieces is hazardous at the best of times, especially under the substructure. Crews must always be careful during installation to prevent damage to this equipment but more important, to prevent injuries to themselves.

Inspection . . . Check each piece of equipment carefully before installation. Examine the condition of the ring grooves, seal rings, backoff rubbers, studs, and nuts. A driller and the tool pusher should inspect the equipment thoroughly while waiting on cement.

Cleaning . . . Carefully clean the blowout-prevention equipment before installation. Use special care in cleaning the ring grooves and ring gaskets. Never allow the crew to use wire brushes, screw drivers, or any tool which will mark these parts. A small piece of wood will clean the rings and grooves, using water or diesel fuel. Never grease these grooves and rings, although they may be very lightly oiled before assembling.

Tightening . . . Every bolt, stud, or nut should be well tightened, going around each connection at least three times, more if necessary. After drilling has commenced, schedule a retightening at least once a week. Be sure to retighten the blowout preventer immediately prior to a drill-stem test or drilling into a known production or lost-circulation zone. One major manufacturer of blow-out prevention equipment puts out a new-type ring gasket that almost eliminates the need for retightening and offers a safer and more reliable seal.

Hydraulic systems . . . Design your hydraulic system as simply as possible. This minimizes the possibility of the contractor making a mistake and crossconnecting a control line. When the crew disconnects hydraulic lines from the preventers, be sure to insert plugs in the preventers to keep them free of foreign materials during the move. Clean all hydraulic connections before installation.

Position the accumulators or other remote-closing devices at least 100 ft. from the well bore. In winter weather cover the hydraulic lines on these devices to prevent freezing. Connect the emergency nitrogen to the closing line in such a way that you can check the pressure at any time. Be sure to wire the electric power for the accumultor in such a way that it will still operate even if all electrical power is cut off to the rig.

Maintenance . . . Carry out your maintenance inspections according to the manufacturer's recommendations, or oftener if the situation demands. On wells where ram changes are necessary the blowout preventer should be getting sufficient inspection. Where no ram change is required, they should be dismantled and inspected on every well approximately once every 30 drilling days. Set up a standard closing time for a preventer. This can be done by observing time required to close the preventer at a given hydraulic pressure when it is new or

when you know it is working properly. Thereafter any time it takes longer to close, you should run a maintenance check immediately.

Careful planning a must . . . Canadian operators are doing an admirable job in supplying the drilling contractor with the complete drilling program. This is a big step forward in reducing the chances of a blowout. But it is the contractor's responsibility to carry the drilling program out to the best of his ability, not only with regard to blowout prevention but in its entirety.

Proper equipment is absolutely essential for blowout prevention. The operator and the contractor should sit down together and discuss the particular well or operation and mutually agree upon the equipment to be used. From then on, it is the contractor's responsibility to equip his rig as agreed.

Alberta's Conservation Board reports that the standard of blowout-prevention equipment has improved appreciably over the past year or two, and this trend should continue. However, at the moment in a few cases there is a drastic need for improvement in crew training and maintenance. Recently the board inspected all the rigs in Alberta and found 10 drilling rigs where either one or both of the preventers did not close. A follow-up inspection found two rigs where this same situation still existed. The most common fault, according to the board, is failure to install the blowdown or bleedoff line, or if it is installed, it is not tied down properly.

EDITOR'S NOTE: For a detailed article on "Blowouts; How to Prevent Them and How to Handle Them," see The Oil and Gas Journal, October 14, 1957, page 139. This excellent and comprehensive Journal article also appears in Driller's Handbook No. 1, and copies of this handbook are available through the Journal's Reader Service Department.

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BOOKS

GEOLOGY OF THE FLANKS OF THE OZARK UPLIFT. By George C. Huffman. Bulletin 77, Oklahoma Geological Survey, Norman, Okla. 281 pp. plus set of maps.

This publication by the Oklahoma Geological Survey is particularly timely in view of the current oil activity in the McAlester basin. The report covers a portion of the extreme northeastern part of the basin and gives oil geologists a resume of the stratigraphy and structure of the area.

In addition, the report includes a complete bibliography and several measured sections that will be particularly helpful. There are five detailed surface geological maps showing the outcrop pattern and structural relationships.

BIBLIOGRAPHIC SURVEY OF CORROSION: 1954-55. Compiled by A. Irene Humphrey. Published by National Association of Corrosion Engineers, 1061 M. & M. Building, Houston 2, 468 pp. Nonmembers NACE, $20; members NACE, $15.

A selection of 4,287 abstracts of articles on corrosion and corrosion prevention published in 1954-1955 are compiled in this volume.

Also included are a number of abstracts published from 1945 to 1953 which were not available for use in earlier bibliographies. Material was selected from abstracts compiled by 23 agencies covering literature internationally.

Abstracts are arranged topically into eight main groups: general, testing, characteristic corrosion phenomena, corrosive environments, preventive measures, materials of construction, equipment, and industries. Each main group is subdivided and topical cross-references are appended.

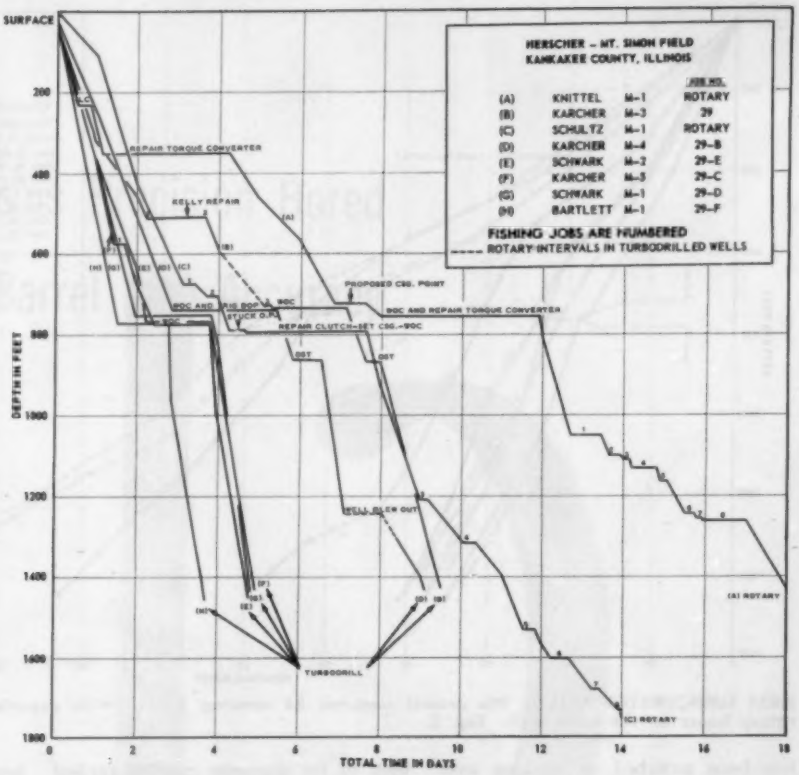
The subject index, in addition to terms in the NACE Abstract Filing Index, lists many metals and alloys by trade name and indexes them as to specific properties and to behavior in specific media. An author index is included.

Referencing is to classification and serial numbers of abstracts for ease in searching. An appendix has been included to aid the user in locating and obtaining copies of unfamiliar foreign or domestic journals.

This is the sixth in a series of NACE bibliographies on corrosion literature. The preceding five volumes, covering 1945 through 1953, contained 15,758 abstracts.

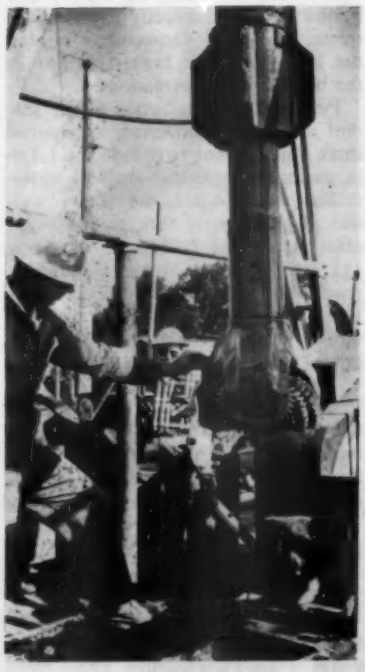
Note: The Oil and Gas Journal maintains a book department. Write to the READER SERVICE DEPARTMENT, P. O. Box 1260, Tulsa 1, for copies of the book list. Often books reviewed here may be purchased from this source.

DAILY DRILLING RECORD of six wells drilled by turbodrill and two by rotary show advantage of the new drilling method. Fig. 1.



This contractor wanted to know—and was willing to take a chance—the result . . .

Turbodrill gamble is paying off



TOOL PUSHER on Moran's Rig 14 checks the big 17½-in. bit prior to making hole with the turbodrill.

IT'S USUALLY up to the oil companies to test new drilling tools; drilling contractors' profit margins are so small they can seldom forsake old, tried methods and equipment to take chances on new ones.

That has been the case with the turbodrill up until now. However, Moran Brothers Drilling Co. took the chance on the turbodrill in drilling gas-storage wells at Herscher dome, Illinois. The gamble is paying off handsomely in faster drilling, cheaper rig maintenance, and fewer fishing jobs.

There are other areas with similar formations and hole sizes to drill. In these areas, contractors can profit by Moran's experience.

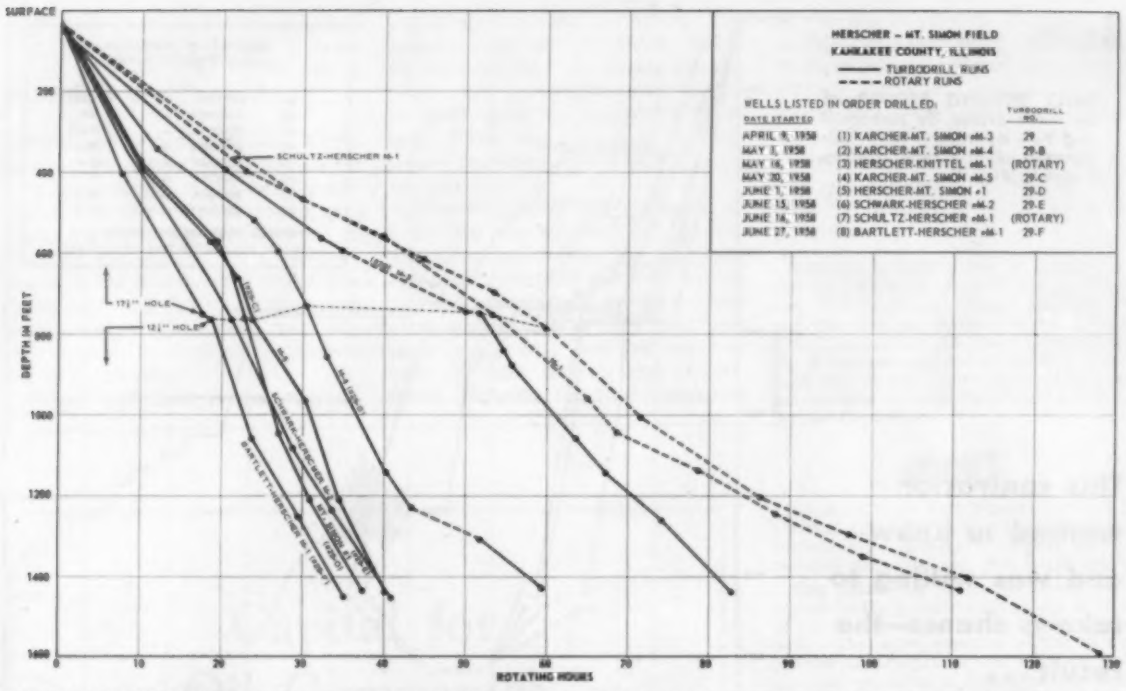
Big hole in shallow, hard rocks . . . Moran is drilling 2,500-ft. wells in shale, sandstone, and dolomites. These formations, though shallow, are very hard, abrasive, and broken. Because of the casing program, the hole must be large in diameter. These conditions make regular rotary drilling very difficult.

At the shallow depths with regular rotaries, it is impossible to apply enough weight to the 17½ and 12¼-in. bits to prevent their "bouncing" in the hard and broken formations. This bouncing sets up vibrations which cut drilling rate, dull the bits quickly, causes the drill pipe to twist in two, and literally shake the rig to pieces. Even with the lightweights, there is some trouble with crooked hole.

The turbodrill is smooth in its operation; it drills with less bit weight than does the rotary. As a result, Moran decided to try it. The result has been spectacular. The turbodrilled wells have cut from 16 to only 3 the number of total days required to drill and set two strings of casing. Rotating hours have been cut from 111 with rotary to only 35 with the turbodrill.

In addition, the drill-pipe twistoffs which plagued rotary drilling, disappeared in the turbodrilled wells. No turbodrill hole has been more than ¾ ° off vertical.

The operator of the gas-storage field, Natural Gas Storage Co. of Illinois, gains from the turbodrill; its current drilling program will be completed early with only one drilling rig instead of the two or three that might have been required otherwise. As a matter of fact, a second drilling rig which was in the drilling program


HERSCHER – MT. SIMON FIELD
KANKAKEE COUNTY, ILLINOIS
TURBODRILL RUNS
ROTARY RUNS
WELLS LISTED IN ORDER DRILLED:
DATE STARTED
TURBODRILL NO.
APRIL 9, 1958 (1) KARCHER-MT. SIMON #6-3 29
MAY 1, 1958 (2) KARCHER-MT. SIMON #6-4 29-B
MAY 16, 1958 (3) HERSCHER-KNITTEL #6-1 (ROTARY)
MAY 30, 1958 (4) KARCHER-MT. SIMON #6-5 29-C
JUNE 1, 1958 (5) HERSCHER-MT. SIMON #1 29-D
JUNE 13, 1958 (6) SCHWARK-HERSCHER #6-2 29-E
JUNE 16, 1958 (7) SCHULTZ-HERSCHER #6-1 (ROTARY)
JUNE 27, 1958 (8) BARTLETT-HERSCHER #6-1 29-F
SURFACE
DEPTH IN FEET
ROTATING HOURS
SCHULTZ-HERSCHER #6-1
17½" HOLE
12¼" HOLE
IDECO
KNITTEL
BARTLETT-HERSCHER #1 (29F)
SCHWARK-HERSCHER #1 (29E)
KARCHER-MT. SIMON #6-5 (29C)
KARCHER-MT. SIMON #6-4 (29B)
KARCHER-MT. SIMON #6-3 (29)

FIRST TURBODRILLED WELL in this project required 84 rotating hours. With experience, time was cut to only 35 rotating hours on the sixth well. Fig. 2.

has been switched to working over older wells.

Had experience in area . . . In April of this year, Moran began the expansion program of 10 or more wells to be completed before fall. Previously, Moran had drilled 25 wells in the Herscher area with the regular rotary method. In fact, Moran reports that a new rig was "worn out" in that previous work and had to be junked.

Wells in the current program are drilled to a gas-storage reservoir in Mount Simon sandstone at about 2,440 to 2,600 ft. subsurface. Only an 8¾-in. hole with 7-in. casing is required at this depth. However, two strings of larger casing are necessary to case off upper formations already in use for gas storage. The upper formations are hard and broken dolomites and sandstone with a particularly abrasive sandstone, the St. Peters, at 530 to 750 ft. The Trempealeau dolomite, from 1,100 to 1,400 ft., also is quite difficult to drill.

A typical well program starts with 20-in. conductor set to a depth of 30 ft. Next, 17½-in. hole is drilled to 750 ft. and 13⅜-in. casing cemented. A 12¼-in. hole is then drilled to 1,440 ft. and 9⅝-in. casing is set. From this point to total depth of about 2,550 ft. an 8¾-in. hole is drilled and cased with 7-in.

Turbodrills are used in the 17½-in. and 12¼-in. hole. In the 8¾-in. hole below 1,440 ft. enough weight-per-inch of bit diameter can be applied that regular rotary methods are used.

Little rig, big pump . . . Moran is using a small rotary drilling rig with a 96-ft. jack-knife mast. The draw works is rated at 3,500 ft. with 4½-in. drill pipe, and the pump is rated at 300-hp.

Dresser's 80-stage, 10¼-in. o.d. turbodrills are used. These require about 800 g.p.m. of drilling fluid to be circulated. For this reason, an Ideco Mud-Master 600 pump with electric drive is used to supplant the rig pump.

Charts tell the story . . . Fig. 1 plots daily drilling progress of eight wells; two by rotary and six by turbodrilling. This shows depth versus total days and the events of each day. Fig. 2 plots depth versus the actual drilling hours.

The first turbodrilled well is the Karcher M-3 (29) which required 9½ days to reach the casing point at 1,432 ft. Fig. 2 shows that only 84 drilling hours were required. Repairing the rig cost as much time as did lost circulation at 600 ft., which required a rotary bit run.

With each succeeding well, performance improved so that the sixth turbodrilled well, Bartlett M1 (29F), was drilled in 3¾ days with only 35 rotating hours.

In spite of Moran's previous experience in the area, the first rotary well, the Krittel M1, required 18 days to reach 1,432 ft. Of this time, 115 hours, or 4¾ days, were on-bottom rotating hours. Approximately 1½ days were required to set 13⅜-in. casing at 755 ft. The remainder of the time, 12 days, was spent in repairing the drilling rig or fishing for eight twistoffs. These rig repairs and twistoffs resulted directly from the extreme vibrations caused by running the large bits with limited weight in the hard, broken formations.

Performance was better in the second rotary well; however, it required three times as long to drill to the 1,430 ft. casing point as did the best turbodrilled well. Again the rotary well was plagued by rig damage and twistoffs. A total of 11¼ days, including 111 rotating hours, were required to reach the casing point. On the other hand, the best turbodrilled well required only 3¾ days (35 rotating hours) to reach the same point.

Pump is help deeper too . . . Although the charts don't show it, drilling is faster in the 8¾-in. hole below 1,440 ft. on the rig equipped for turbodrilling than on the conventional rig. The hydraulic horsepower of the big pump allows jet-bits to be used to advantage. This jet drilling cuts the 8¾-in. hole in about 6 days with four bits while the rig with the small pump and conventional bits takes about 19 days and eight bits. Total time for conventional rotary drilled wells is 27 to 30 days, while turbodrilled-jet-bit-drilled wells require 10.

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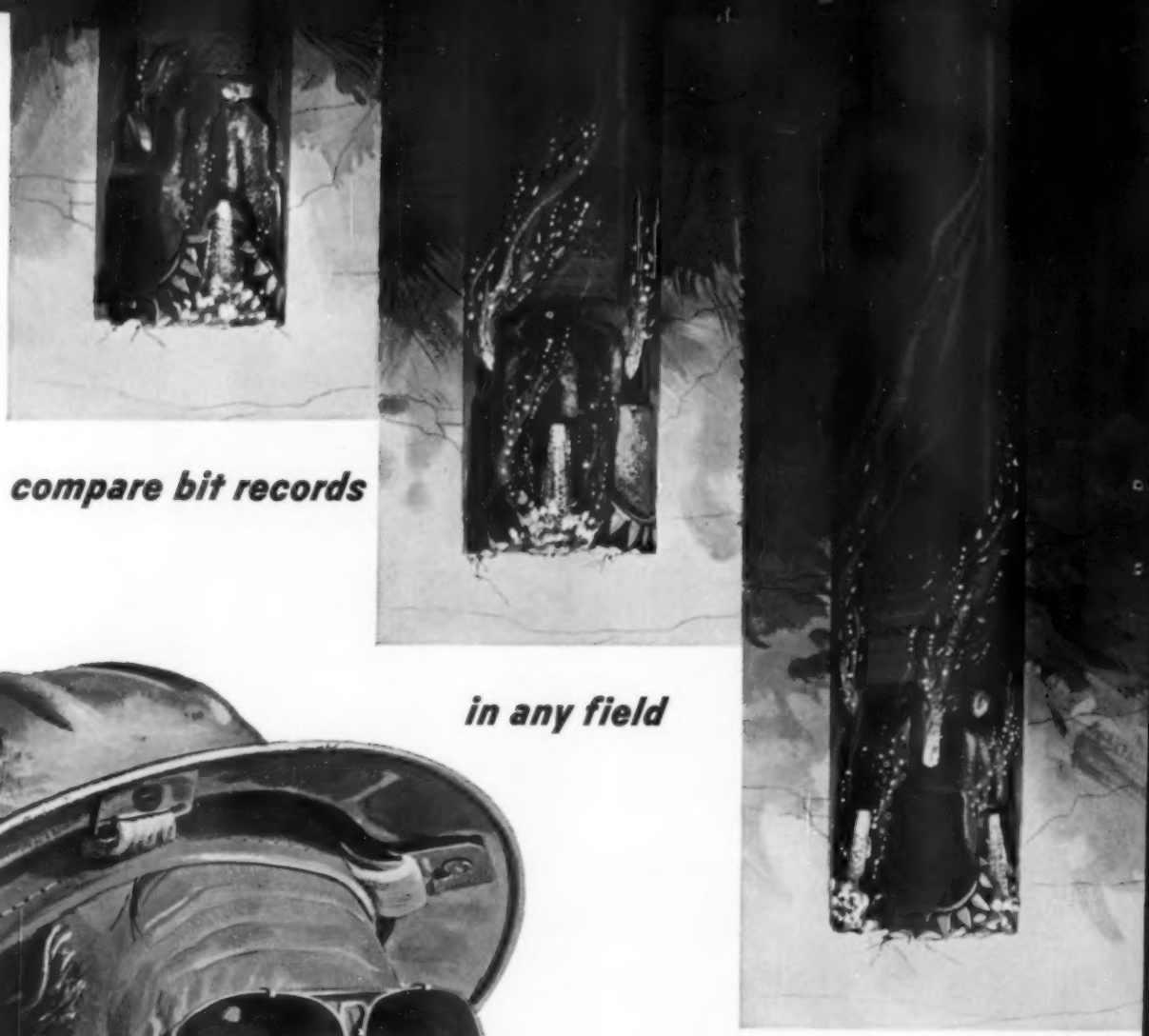

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Alouette Sets Six New World Records

Farmingdale, L. I.—Among six records for rotary-wing aircraft established by the Alouette, a jet-powered helicopter, is a new world altitude figure of 36,501.125 feet. This is 6,201.125 feet higher than the one set in December 1957. Official confirmation is expected shortly from the Federation Aeronautique Internationale. The information was released here by Republic Aviation Corporation, who assembles and markets this five-place, French-designed craft in the United States and Canada.

All six records were set at the French Air Force Test Center, Bretigny, on June 13, a Republic spokesman stated. Included was a record for climbing to 31,267 feet with two passengers, topping the mark for helicopters in the 2,205-lb. to 3,858-lb. payload class.

The Alouette is not only setting new world records abroad, but in the U. S. it is establishing outstanding operational figures daily. One example is its performance for Aetna Helicopters, Inc., flying out of New Mexico for the U. S. Forestry Service. Within 30 days, one Alouette has . . . carried 54,623 lbs. of cargo, 214 passengers—made 246 flights—flown 97.51 hours with an amazing corrective maintenance figure of only 3 hours. Working at altitudes ranging from 7,000 to 10,000 feet every time, as many as 32 missions have been accomplished in one day of operation.*

Equally impressive are the Alouette's commercial performances at sea level. Operating out of Louisiana in the Gulf of Mexico, the Alouette II is now serving oil rigs located 72 miles off shore at high temperatures and under maximum gross load requirements.

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FARMINGDALE, LONG ISLAND, N. Y.

BY W. L. NELSON
Technical Editor and
Petroleum Consultant

Efficiencies and power required in estimating pumping costs

THE FLUID HORSEPOWER required to pump a liquid may be computed from one of the following sets of units:

$$\text{Fluid horsepower} = \frac{Wh}{33{,}000} = \frac{\Delta PG}{1{,}713} = \frac{Ghd}{3{,}957} = \frac{\Delta PB}{58{,}600}$$

in which:

W = weight of liquid, lb. per min.
h = head, feet of fluid
G = g.p.m. at 60° F.*
ΔP = discharge minus suction pressure, psi.
d = specific gravity at 60° F.*
B = barrels per day at 60° F.

*Can also use gallons and specific gravity both at operating temperature. One fluid horsepower is the equivalent of 0.745 kw.-hr. of electrical power, but it must be increased by the efficiency of the pumping equipment and by the efficiency of the motor drive (85-96%).

To obtain the power required from the driver, it is necessary to divide the fluid horsepower by the mechanical (including hydraulic) efficiency of the pumping equipment. The efficiencies of reciprocating pump need not be considered here because the stream consumptions stated in Process Costimating No. 21 (July 28, 1958, p. 187) already account for efficiencies.

Properly selected single-stage centrifugal pumps handling nonviscous oils (or water) operate at 75-85% efficiency but for average services the efficiency is probably not over 70%, and 70% is used herein in obtaining pumping costs. Multistage pumps operate at lower efficiencies, and for estimates of power cost, values of 52 to 72% depending on the degree of staging, are required in attaining the high pressures. Viscosity greatly decreases capacity, head, and efficiency of centrifugal pumps. All of these situations are summarized for cost-estimating purposes in Table 2.

So many different types of rotary pumps are available and their efficiencies are so much dependent on the physical condition of the pump (closeness of clearances) that only gross approximations are possible.

TABLE 2

Centrifugal Pump Efficiencies (Per Cent) for the Purpose of Estimating Pumping Costs*

Visc. S.U.s. at pumping temperature	Efficiencies (%) Single-stage	Efficiencies (%) Multistage high pressure
water	70.0	52.0-72.0
50	69.5	51.5-71.5
100	65.5	48.5-67.5
150	62.0	46.0-64.0
200	59.0	44.0-60.5
300	55.0	41.0-56.5
400	51.5	53.0
500	49.0	50.5
600	47.5	49.0
800	44.0	....
1,000	42.0	....
2,000	34.5	....
3,000	30.0	....
5,000	25.0	....

*Pumps for viscous services are also more expensive because the capacity and head is also decreased when pumping viscous fluids.

TABLE 1—MECHANICAL* EFFICIENCIES OF RECIPROCATING PUMPS

Stroke (in.)	Piston type	Outside plunger to 300 psi.	Pressure types: To 1,000 psi.	Pressure types: Over 100 psi. and thick liquids	Minimum for liquids at their B.P.
3	49	47	44	38	15
4	53	52	49	41	17
5	59	56	53	46	20
6	65	61	58	50	22
7	68	64	60	53	25
8	71	67	63	55	27
10	76	72	67	58	31
12	78	74	70	60	35
15	80	76	73	62	40
18	82	78	75	64	45
24	85	81	77	66	50
36	87	83	79	68	60

*Hydraulic efficiency is usually negligible, but the volumetric efficiency often ranges from 89 to 93%.

In general their efficiencies are about equal to or are somewhat superior to the efficiencies of reciprocating pumps, thus:

Pressure	Type of fluid	Efficiency
Low	Viscous	90
	Thin*	75
High	Viscous	80
	Thin*	50

*As at or near boiling point.

If the pump is badly worn, the efficiencies are much lower.

Driver horsepower . . . The fluid horsepower discussed heretofore is divided by a suitable efficiency to obtain the horsepower required from the drives (motor, turbine, or engine, etc.). The cost of operation is then obtained from Process Costimating No. 22 (Aug. 11, 1958, p. 123) or in the case of reciprocating pumps, the steam required is obtained from Process Costimating No. 21 (July 28, 1958, p. 187).

As an example, 3,000 bbl. per day of gasoline is to be moved from an atmospheric-pressure storage tank into the top of a tower. The differences in elevation; the friction loss in the lines, fittings, etc.; and the pressure in the tower, together all constitute a pressure difference between suction and discharge points of 43 psi. The fluid horsepower required is:

$$\frac{43.0 \times 3{,}000}{58{,}600} = 2.2 \text{ hp.}$$

If a centrifugal pump is used (efficiency = 70, or see Table 2), 3.15 hp. is required from the driver. If an electric motor is used for the job, the cost of operation (Process Costimating No. 22, Aug. 11, 1958, p. 123) will be about 3 cents per hour (72 cents per day) at an electrical power cost of 1 cent per kw.-hr., or if the actual cost of power is only 0.7 cent per kw.-hr., the pumping cost will be only $0.7 \times 72 = 50.5$ cents per day. The cost of 3 cents per hour was obtained from the chart of Process Costimating No. 22 by reading at 31.5 hp. and dividing the cost by 10.

The cost would have been greater with a steam-turbine drive ranging from 4.5 to 7.6 cents per hour (depending on the steam pressure) if steam is valued at 45 cents per 1,000 lb.

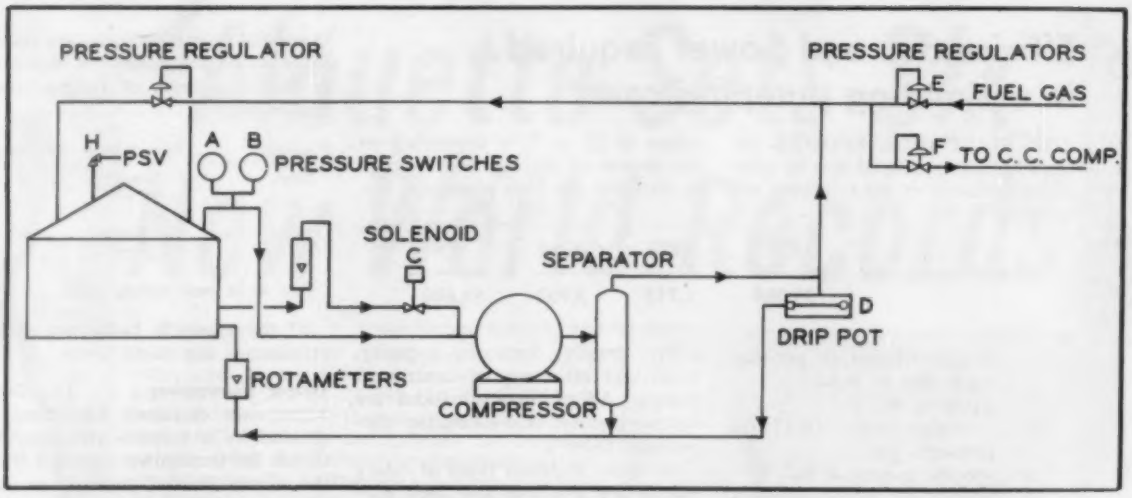

Fig. 1.

This system of vapor recovery means

Cone-roof tankage

Can be used to store gasoline with negligible vapor losses

E. W. WILSON
Product-Movement Engineer
Phillips Petroleum Co.

BREATHING, filling, and wicking losses have been eliminated and savings estimated at approximately $40,000 per year have been realized by installation of a vapor-recovery system on cone-roof tankage in 8 to 13 R.v.p. gasoline service.

Installed on three 55,000-bbl. cone-roof tanks at the Phillips Petroleum Co. Okmulgee, Okla., refinery, the vapor-recovery system utilizes a unique rotary liquid-seal compressor.

The initial cost of the system, which has operated successfully for 2 years, was less than the yearly savings.

Replacement problem . . . The refinery was faced with replacement of worn-out floating-roof tankage in the service of finished motor fuel. A review of the tankage indicated the possible usage of two 55,000-bbl. cone-roof tanks. The problem then arose of what type vapor conservation could be used on these cone-roof tanks. After considering the advantages and cost of a number of methods of conservation, it was decided to install a system using a rotary liquid-seal compressor.

Sweet natural gas for blanketing of these tanks, and a compressor on the catalytic cracker which could handle the noncondensables were available. This system appeared to offer the following advantages: (1) a greater recovery potential than any other method considered, (2) a lower initial investment, and (3) a lower maintenance expense.

The fact that advantage could be taken of the unusual feature of a liquid-seal compressor absorbing and condensing the vapors at the compressor enhanced the ultimate payout. The merit of this system was so pronounced that a decision was made to not only use this system on the two 55,000-bbl. cone-roof tanks for finished motor fuel, but also to tie this system into a 55,000-bbl. cone-roof tank in debutanized natural-gasoline service.

This new system of vapor recovery has been in operation since July of 1956, and has indicated near 100% recovery of vapors.

System Layout

Fig. 1 illustrates schematically the entire system. Tank vapors are compressed and partially absorbed and condensed in the rotary liquid-seal compressor. Seal liquid enriched with absorbed and condensed vapor is returned to the tank and compressed vapor discharged to the compressor on the catalytic cracker unit for further recovery.

The liquid-seal compressor is turned on automatically by a sensitive pressure switch A when the tank pressure reaches 1-in. H_2O pressure. The compressor is turned off automatically by the sensitive pressure switch B at 0.1-in. H_2O pressure. The motor starter activates the solenoid valve at C, allowing seal liquid to flow from the bottom of the tank to the compressor.

A rotameter was installed on the seal liquid line to indicate the volume to the seal. It was found desirable to add a small booster pump operating on the extended motor shaft, to provide a positive seal pressure to the compressor, enabling the pumping of the storage tank down to within a few inches of the bottom.

Unique seal . . . The rotary liquid-seal compressor is unique, in that it uses seal liquid from the tank to seal the compressor rotor. The liquid sliding in and out within the buckets of the rotor acts as a liquid piston. The intimate contacting of the higher temperature vapor with the relatively cool liquid drawn from the bottom of the tank causes absorption and condensa-

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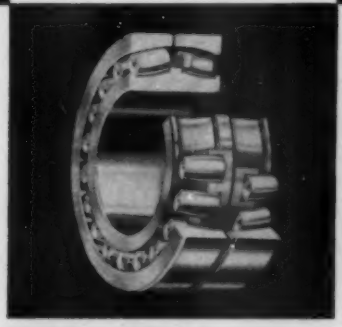

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tion to take place within the compressor. The liquid is discharged from the compressor separator and is returned to the storage tank through a rotameter, to indicate volume returned.

Drip pots at D, with automatic drains, are provided in the low points of the gas header system throughout. Liquid from these drips are returned to the tanks by line pressure.

Pressuring system . . . The system is normally operated at 18-psig. compressor discharge. It was thought wise to provide a repressuring system, using natural gas, to prevent any air from entering the tanks during high drawdown rates. This gas is admitted to the system by automatic control E. Gas is released to the cat cracker compressor suction at F.

Supersensitive gas regulators, located at G, admit gas to the tank when the pressure drops to 0-in. H_2O pressure and close gas out at 0.1-in. H_2O pressure. For added safety, standard atmospheric and vacuum release valves at H are provided. These valves open at 1.5-in. H_2O pressure and start to open on vacuum at 1-in. H_2O vacuum.

Since the initial tests indicated that about 90% of the vapors are recovered in the compressor, the value of the line returning the noncondensables to the suction of the cat cracker compressor may be debatable.

Two-tank system . . . The two 55,000-bbl. cone-roof tanks in finished motor-fuel service were tied into the system with one compressor. The 55,000-bbl. tank in debutanized natural-gasoline service was connected into the system with its own compressor, due to this tank being a considerable distance from the other two tanks. These compressors absorbed and condensed approximately 90% of the vapors, which were returned to their respective tanks with the compressed vapor discharged to the compressor on the refinery catalytic cracker for recovery.

The system has performed very satisfactorily. All indications are that the losses have been reduced to zero on the tanks so equipped, and it may be applied to other tanks. It should have wide application in the chemical industry when storing volatiles. Its use in the field of production should certainly be considered as a means of maintaining crude gravity and the recovery of vapors which normally would be very rich.

The cost will vary with each installation, and will depend to a considerable extent on what facilities are already available and what has to be provided new.

Microballoons—5 years later

Standard recently checked 30 tanks which had been covered with microballoon foam in 1953. Here are the results of the check

MICROBALLOONS developed for the conservation of crude oil in cone-roof tankage by Standard Oil Co. (Ohio) have been in field use for approximately 5 years. Sohio has some 100-plus cone-roof tanks covered with Microballoon foam since the fall and winter of 1953.

This spring 30 of these tanks were inspected to check on the condition of the foam after approximately 5 years of working and static storage.

- Five out of every six tanks contained foam coverings that were in excellent condition.
- Five of the thirty tanks inspected had lost some or all of their coating due to operational problems.

Pipeline tanks . . . Fifteen of the tanks inspected are in working service as a part of the Sohio Pipe Line Co. system in Illinois and Indiana. The working cycle of these 15 tanks ranges from 2 days to 2 weeks with pumping rates as high as 75,000 bbl. per day. A ½-in. Microballoon foam layer was installed on these tanks between October 1953 and February 1954.

Subsequent field work has indicated that a ½-in. layer of foam for a working tank does not contribute enough mechanical strength and rigidity to withstand the turbulences generally associated with high delivery rates and rapid turnovers. The success of the ½-in. foam in these Sohio Pipe Line tanks is attributed to low delivery rates in some, and the effective use of distribution nozzles and "spiders" in tanks where pump-in rates are high.

Of the 15 working tanks inspected, 12 were found to be in excellent condition. In three tanks, however, the foam had been pumped out. This loss was directly pinpointed to extreme mixer operation necessitated by the need to remove very high b.s. and w. accumulations in the tanks. Normally, mixers are operated only during delivery to the tank or with a full gage in a tank containing Microballoons.

In every instance with these three particular tanks it was necessary to operate the mixers while pulling the tanks down to a low level to remove the heavy accumulations of b.s. and w. As a result, the Microballoons were also pumped out.

The 12 tanks with excellent coverage had an average foam thickness of 0.42 in. The difference of 0.08 in. between actual thickness and that which was installed is not due to loss but to packing of the foam, and this packing all occurred in the first year after installation. For the past 3 years measurements have indicated the foam thickness has remained constant.

Static storage . . . Fifteen static crude-storage tanks were also inspected in Sohio's Cygnet and Morehead tank farms. Of the 15 tanks inspected, 2 were the original field-test tanks used in the development work and the foam layer in these 2 tanks will be 6 years old this fall. The rest of these tanks have foam in them that will be 5 years old this fall. The ½-in. foam in all these tanks was installed by using a mechanical foam eductor, as many as six or eight tanks being equipped with Microballoons from a single eductor location.

Two of the fifteen tanks showed some loss due to uncontrolled pump-outs because of the effect of high b.s. level on jointed swing lines. The other 13 had very effective coverage, the foam in some instances being stiff enough to hold up pennies dropped through the top manholes. All 15 tanks inspected were sealed by the foam against evaporation loss.

While in this case it was not possible to separate evaporation loss from over-all tank-farm losses, the reduction in over-all tank-farm loss over a year's period equaled approximately 85% of the calculated loss that would have been experienced from uncovered tanks. Advantages of the foam can be seen in gravity retention of the crude, a physical property that is normally reduced with long-term storage. Every yearly inspection also extends the prediction of life of the foam on both the static and working tanks.

It was originally expected that foam life on worked tanks would be shorter than the foam life on static-storage tanks. Our experience indicates that the present life expectancy of foam in worked tankage with a low internal turbulence factor should be equal to that on static storage.

On the Job

PIPELINING

What happens to remote-controlled equipment during power failures? Here are details on emergency power for microwave stations

BY W. E. FREESE
Sinclair Pipe Line Co.

THE IMPORTANCE of standby power for microwave stations has become more apparent during the past 9 years due to the increased use of telemetering, remote control, and data-transmission equipment.

For these different types of automation equipment to work properly, the transmitting and receiving equipment—often located many miles apart—must be connected by a highly reliable communication link such as a microwave system.

There are many types of microwave equipment. They may be very reliable in themselves, but they are dependent upon a source of electrical energy to keep them operating. Ordinarily, this electrical energy may be bought from the commercial power companies.

During the periods when there is an interruption in the commercial power, however, the microwave station either goes off the air or it must receive electrical energy from a standby source. Some areas will experience more interruptions in the commercial power source than others, but in any case it will be a decision for the user whether to install a source of standby power or tolerate the outages caused by interruption in commercial power.

In general there are two things that may happen when a microwave station loses its source of power. One is for the stations each side to squelch which will allow the system to be used each side of the disabled station. The other is for the system to go into noise due to loss of signal.

Both of these are objectionable. One cuts the system in two so that a signal originating on one section cannot reach the other section. If the system goes into noise, the complete system is disabled, and the telemetering and remote-control equipment may give all sorts of wrong readings since the noise will cause the narrow-band tone equipment to give a very erratic series of long and short pulses which may duplicate a code to a remote-control device thereby causing a false reading or operation. The more complicated the code the less chance for duplication. The more-complicated code calls for the equipment to be more complex, however, which is undesirable from a maintenance standpoint.

Presented at the AIEE southwest district meeting Tulsa 1958.

Standby Power Sources

To prevent this interruption the user may install a standby engine-generator set, or a battery bank. When a battery bank is used for standby power the station generally uses tubes which work directly from the battery voltage. In addition, an inverter is used when needed to change the battery voltage to 110 volts a.c., which can be changed to high voltage for the Klystron supply.

A battery standby system has the advantage of having no interruption whatsoever when the commercial power fails. Only the chargers, lights, heating, and other less-essential equipment is disabled while the electronic equipment continues to operate without an interruption. The main disadvantage of the battery standby is the cost—high in comparison to the engine generator.

The engine-generator standby is probably the most common type of standby and may be of the continuous-power type or the regular type. The continuous-power type is composed of an a.c. motor and a.c. generator and flywheel coupled to an engine by a magnetic clutch. At present, gasoline or LPG fuel systems are available for these engines. No diesel engines are available due to the additional mass of the engine, which would require a larger flywheel to make the quick start.

When the commercial power is interrupted the magnetic clutch is released, coupling the crankshaft of the engine which is cranked at normal running speed by the flywheel inertia. In actual practice on a 5-kw. unit, the engine will start and take over the load with less than 3% change in voltage.

The flywheel also acts as a speed stabilizer which in effect is a voltage stabilizer having the same effect regardless of whether the commercial power is being used or the standby engine is carrying the load. These continuous-power plants provide uninterrupted power, but this service does not come free of charge.

The initial cost is a little higher than the regular engine-generator set, and since the motor and generator are rotating at all times, the maintenance runs a little higher; the power bill will be higher, too, since the efficiency of the motor-generator will ordinarily be about 65%.

Power Interruption

The regular engine-generator set is fine for providing standby power when the commercial power is interrupted, but will always allow a short interruption when the unit is being started and until the generator is up to speed and assumes the load. This period between the failure of commercial power and the time when the generator assumes the load will vary between 2 seconds and about 1 minute depending upon whether the conditions for starting an engine are favorable or unfavorable.

Conditions affecting the starting time are ambient temperature, carburetor fuel supply, ignition and mechanical parts of the engine in good

THE AUTHOR

W. E. Freese is communication engineer for the Sinclair Pipe Line Co., and has been in that post for the past 2 years. For 3 years prior to his communication work, he was instrumentation engineer for Sinclair, and the 2 years preceding that he spent as a Sinclair corrosion engineer. He is an associate member of AIEE and a member of the Instrument Society of America.

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On the Job

PIPELINING

repair, and battery condition. When all conditions are favorable and the engine starts in just a few seconds, the microwave station will still experience a power interruption of 30 seconds to 1 minute. This is due to the filaments of the tubes cooling off until the standby unit assumes the load and then having to reheat before the transmitter is back at full power output.

The regular standby power unit is very reasonable on initial cost, does not lower the efficiency of the usable power below the commercial power, has no moving parts while the commercial power is available, is fairly dependable, and is available with gasoline, LPG, and diesel-fueled engines.

Bridging Interruptions

A method for bridging the short interruption between commercial power failure and assuming the load by the engine-generator is to have a fairly small battery bank feeding some type of inverter which would supply the a.c. power until the engine-generator can get up to speed. The battery bank in this case will only be good for a few minutes and cannot be counted upon to keep the system going should the engine generator fail to start.

To do so would require a battery bank large enough to make the engine-generator set unnecessary. The inverter may be of the vibrator, rotary inverter, or electronic type which may use tubes or transistors. The vibrator type is fast starting but is subject to reed splitting and contact burning.

The rotary inverter is slower to start, possibly taking half a second to get up to speed for a 300 to 500-watt unit and taking still longer for the larger units which could defeat the purpose it was installed for. The electronic inverter is fast operating but is rather expensive for the high power rating required to carry the whole station.

Small Battery Bank

A compromise method which we are working on at present is to add a small battery bank and transistorized inverter to microwave stations which are already equipped with regular engine-generator sets. These inverters are only rated at 300 watts and therefore not capable of carrying the whole station but will carry the radio-frequency (RF) equipment alone.

When the multiplex equipment at a station loses its power, it only affects that one station and as long as the RF continues to function, all of the other stations down the line will not be affected. Our small battery bank and small inverter, therefore, will keep the system intact except for the multiplex at the one station.

This means that all of the telemetering, remote control, and data transmission between all other points will be unaffected by a power interruption at any point along the system. Since the multiplex equipment will not cause noise due to lack of power, the one station affected will only lose contact with the control station for a 30-second period required for the engine-generator to have the equipment back in normal operation.

Since we are only supplying the RF with 300 watts power, our small battery bank will have sufficient capacity to continue carrying the RF for 2 hours with a 10% decrease in voltage and is expected to keep the RF in operation for 3 or 4 hours before the voltage is low enough to cause RF failure.

The standby power situation is alarmed so that the wire chief can dispatch a maintenance man to the location should the engine-generator fail to start. He could usually reach the station and start the engine-generator, or the commercial power will return, before the RF would be lost.

From the nature of the usual pattern of power outages and the reliability of the standby engine-generator set, it would be a rare occasion for the small battery bank and inverter to be called upon for more than one extended period of operation in any 1 day. Therefore, it is unnecessary to have a quick recharge on the batteries; 12 hours may be allowed for recharging from an extended use.

The ordinary period of use—3 to 10 seconds in length—will be of little consequence. The charger capacity is limited to a normal 3 amp. thereby holding the cost down to a minimum adequate for the purpose.

Transistorized Inverter

The inverter selected for this purpose is a 300-watt transistorized unit which has an efficiency of 89% and is unregulated, with an input of 24 volts d.c. and an output of 110 volts a.c. The high efficiency is due to the use of transistors which waste little power in heating, and the elimination of the regulating part which necessarily would waste power to gain the regulation.

A unit such as this will maintain a nearly constant output voltage as long as the input voltage remains constant. In this case the batteries will supply a practically constant voltage over a short period of time and slowly de-

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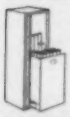

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creasing voltage over a 2-hour period with a final decrease of about 10% in voltage. It is expected that the system would not be lost for an additional hour or more making a total of 3 or 4 hours operating time from this unit.

The maintenance on the units is expected to be very small since the batteries are lead calcium type requiring very little water because there is practically no gassing. The charger is a magnetic regulating type with no tubes or moving parts, and the inverter is transistorized with no tubes or moving parts.

To get an idea of the frequency which a standby power system may be called upon to perform its duty, the actual record of power interruptions on our microwave stations is included in Table 1.

It indicates that the reliability of the commercial power is not the same at all locations. It is very desirable, therefore, to pay the additional cost for some type of continuous power at the locations which are frequent violators and not worth the additional cost where power is highly reliable.

TABLE 1—Average Power Interruptions Per Month Over a 25-Month Period Through January 1958

Station—	Interruptions
Hagers Grove	12.4
Callao	6.5
Louisburg	6.1
Lone Jack	5.9
Ramona	5.3
Drumright	4.6
Corder	4.6
Sand Springs	4.2
Morton	3.9
Kincaid	3.8
LaCygne	3.3
Earlton	3.2
East Chicago	2.6
Mendon	2.5
Norris	2.5
Miami	2.3
Dallas City	2.2
Odell	2.1
Osage	2.0
Table Mound	2.0
Nelsonville	1.9
Adair	1.9
Augusta	1.8
Caney	1.8
Monee	1.7
El Paso	1.4
Spring Hill	1.4
Cushing	1.4
Humboldt	1.2
Flanagan	1.0
Braidwood	1.0
Independence	1.0
Monica	0.9
Key	0.6
Gibbs	0.4
Gunn	0.4
Mazon	0.3
Forrest	0.2
Quincy	0.2

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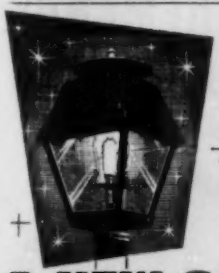

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▶ ▶ ▶ Among the Drilling Contractors

Gobel Joins Staff of Servicing Contractors

James A. Gobel, Jr., of Odessa has been named assistant executive-secretary and field representative for the Association of Oilwell Servicing Contractors. J. F. McAdams, Hobbs, N. M., is president.

AOSC, which represents more than 250 members in eight oil producing southwestern states, recently moved its headquarters office to Dallas from Odessa, with James E. Danheim the newly appointed executive-secretary.

Gobel has had five years experience in the oil supply industry and production equipment in the Permian basin. For the past year he has managed the W. C. Brown Pipe & Supply Co., Crane, Tex. Prior he was a field representative for Fluid Packed Pump Co., in Denver City, Tex., and owned and operated a pump shop as a Harbison-Fischer distributor in Hobbs.

Who's getting the drilling contracts

Winn Hawkins Drilling Co., Houston, is moving a rig to the East Chenier Perdue area of southeastern Cameron Parish, Coastal Louisiana, where it will drill for Humble Oil & Refining Co. The new operation, Humble's first in the immediate area, will be north of the field's two 10,000-ft. gas wells drilled by Austral Oil Exploration Co. Contract is for a 11,000-ft. test. Location is on the East Chenier Perdue gas unit.

Marshall R. Young, Brookhaven, Miss., is getting started on his second well for Arkansas Fuel Oil Corp. in

GATHERED at the site of the Delaware-sand discovery well Hissom Drilling Co., Midland, recently drilled in Ward County, West Texas, are (left to right): R. E. Hissom, owner of the drilling company; Pat Avery, the landowner; Bill Raglin, production superintendent; Craft Thompson, Dallas independent operator; and Woody Williams, Hissom drilling superintendent.

Hissom, deputized as a sheriff in this "West of the Pecos Country," has two rigs running in Ward County on his own properties, and three others on contract for Anderson-Pritchard Oil Corp., and The Texas Co.

His new discovery well, drilled jointly with Thompson, is his 1 Monroe, 6 miles northwest of Barstow, and 1¼ miles southeast of West Quito field. It was drilled to 4,788 ft. and completed with oil production at 4,680 ft.

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New

All service locations and facilities of the E
Lane-Wells technical oil field services system. S
addition of a fleet of mobile electrical well-log
service organization. Such an acquisition, mad
the drilling-producing industry are retrenchi
Industries' confidence in an early upturn and
industry. The larger, more versatile Lane-Wel
keeping with its past record of outstanding s
from this new combination of experience and
now enjoy the advantages of dealing with a si
of well-logging services.

ELGEN ELECTRONIC WELL LOGGING

LANE WELLS COMPANY

ONE OF THE DRESSER INDUSTRIES

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Partners in Progress

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Find out about this important new dimension of our technical oil field services. Use the convenient postpaid card for complete information.

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Company _____

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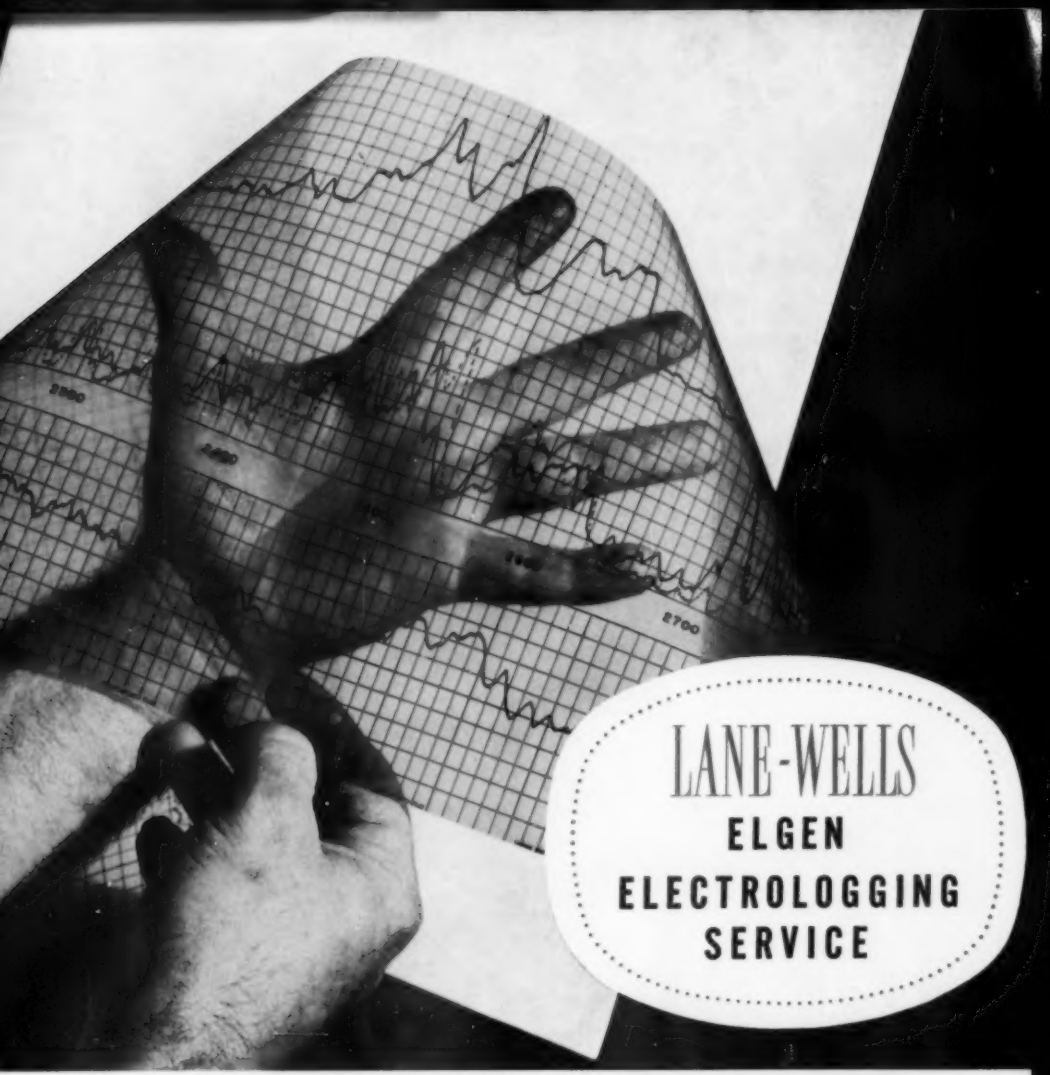

LANE-WELLS
ELGEN ELECTROLOGGING SERVICE

Advantages

logging costs . . . a competitive chedule and minimum rig time.
cale accuracy . . . featuring indi- curve calibration.
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ncy . . . made possible by un- experience in most geographical f operation.
cal service . . . backed by the etive knowledge of the largest our history.

Now all the advantages of Lane-Wells' efficiency and evaluation experience in radioactivity logging are available from the same source in logging of uncased hole. Lane-Wells' Elgen Electrolog employs six standard curves, accurately recorded to provide a comprehensive interpretive system before casing is run. These data include identification of strata and their location, gauging of section thickness, depth of interzone contact, presence of gas and fluids, degree of porosity and permeability.

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STOP H_2S CORROSION BEFORE IT STARTS!

• The Connelly IRON SPONGE purification process at the well site removes hydrogen sulphide BEFORE the gas is piped to central processing. Thus, the cause of pipe line corrosion is eliminated because corrosive gas never enters the transmission lines. Additionally, Connelly IRON SPONGE eliminates the need for extreme close control. It operates with high efficiency at low or high pressures—absorbs more H_2S, gives longer service between foulings and is easily regenerated. If you have a purification problem check this MOST ECONOMICAL solution today. Write for Field Processing Bulletin #OG-7.

CONNELLY, Inc.
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ELIZABETH, NEW JERSEY

the new Magee field, in southwestern Smith County, southern Mississippi. The new job is a diagonal southeast offset to Arkansas Fuel's discovery well, completed last month with oil production from a 13,000-ft. Lower Cretaceous-Sligo sand. Young is using the same rig on the second test.

Carnes W. Weaver Drilling Co. and **Brewster-Bartle Drilling Co.,** both of Houston, are starting new drilling operations in the North Fresh Water Bayou area, in the tidal marshlands of southeastern Cameron Parish, Louisiana. Weaver is drilling for Austral Oil Exploration Co. at 3 Louisiana Furs, a 14,800-ft. well. Brewster-Bartle is working for Union Oil Co. of California at its 3-F Louisiana Furs. It is scheduled to go to 14,200 ft. Both wells are about a mile northeast of Union's discovery well, completed last April with gas-condensate production from a 13,300-ft. sand.

Flournoy Drilling Co., Alice, Tex., is drilling on a new wildcat test for Northern Pump Co. in southeastern Live Oak County, South Texas. It is a 5,000-ft. contract at 1 Rouse, in the Pat Nevin Survey. Location is 4 miles northwest of Mathis, across the line in San Patricio County.

Meadows & Walker Drilling Co., Houston, has a rig working for North Central Oil Corp. on a deep wildcat test in southeastern Lavaca County, South Texas. Location, at 2 Simpson, in the Amanda de la Croix Survey, is northwest of the Southwest Provident City Wilcox gas area. Permit is for a 9,500-ft. test.

Buster Gardner Drilling Co., New Iberia, La., has a new operation going in the Mallard Bay area, Cameron Parish, southwestern Louisiana. It is a contract job for Southwest Production Co. and Preston Oil Co. Location, in 23-13s-3w, is 1½ miles southwest of gas production at Mallard Bay. It is carried as 1 Comegys.

Fred Wilson Drilling Co. is contractor on a new deep well Aluminum Co. of America is putting down in the West Addis area of Iberville Parish, southeastern Louisiana. It is Alco's 1 S. P. Schwing et al Unit 3, in 44-8s-11e. Proposed depth is 12,000 ft.

Thirteen Drilling Co. has a new operation under way in the LaRose area, Lafourche Parish, southeastern Louisiana, where it is drilling for Trice Production Co. It is at 1 P. G. Lake, in 29-17s-21e. Permit calls for a 12,200 test.

DON'T WELD on CASING!

WHY? Because field tests made on "average" oil field welding for mounting scratchers and centralizers have shown a great variation in weld quality, and damage from undercutting, hard spots, and electrolytic corrosion. Now there is no longer any need to depend entirely on welding for scratcher and centralizer installations with possible damage to valuable equipment. You can completely eliminate welding on casing, and at the same time get an economical scratcher and centralizer installation that will not interfere with normal casing running practice . . .

B and W
AUTOMATIC STOP COLLARS

Just Slide Them On and Drive Slips Flush with Casing.

Also use B and W Thread-Lock Cages and B and W Thread-Lock Cement to eliminate welding on bottom joints to prevent unscrewing as drilling continues.

ANOTHER FIRST BY THE FIRST NAME IN PRIMARY CEMENTING TOOLS

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Multi-Flex Scratchers • Nu-Coil Scratchers • Rotating Scratchers, Multi-Flex and Nu-Coil Types • Automatic Stop Collars • Stabilizers • Rotator Collars • Liner Centralizers • Latch-On Centralizers.

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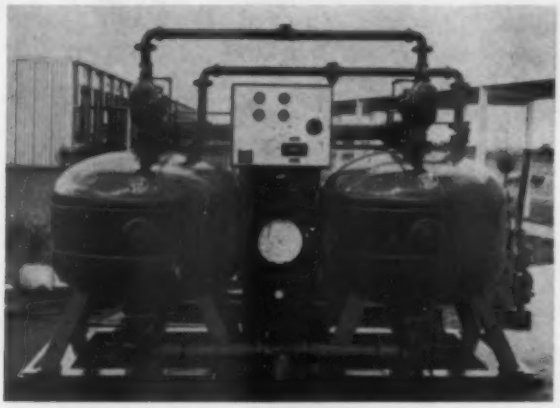
This week's SHOWCASE features . . .



LACT unit features high accuracy

. . . the maker says. The unit measures gross fluid as it is produced and records total volume, automatically corrected to 60° F., on a direct-reading mechanical counter. The unit uses two volume meters. They're synchronized and interlocked to provide practically continuous delivery of metered oil. The interlocking system assures that each vessel is completely filled before the flow is switched to the other vessel. Neither vessel can receive additional fluid until all fluid from the previous cycle has been discharged and the vessel vented.

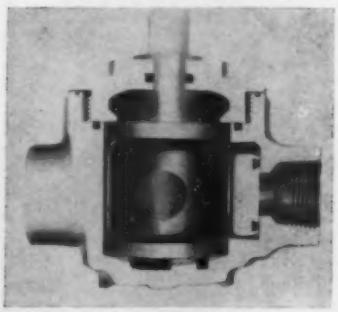
Each vessel has a separate, continuous counter. The total volume metered through both vessels is integrated and recorded on a total-volume counter. The high and low liquid-level controls are isolated from the main measuring chamber. The chamber must be completely full before fluid can enter the passage leading to the high-level control. And it must be completely empty before the low-level control can be actuated. The unit is available with pneumatic or electric pilot control, in 2-bbl. and 10-bbl. sizes. **Write or call: Garrett Oil Tools, Inc., P. O. Box 2427, Longview, Tex., for details on LACT unit.**

Bridge plug eliminates need

. . . for pump trucks during setting operations and is especially designed for high-pressure holes. The retrievable cup type of bridge plug may be run in alone on tubing when a temporary plug is needed for downhole treating or for containing pressure during surface workover operations. It's also designed for isolation of zones to be tested, treated, or squeezed.

The plug's operation is such that setting and retrieving is compatible with the operation of a retrievable test-treat-squeeze packer. This combination permits straddling desired zones, so that several may be isolated individually for treating or testing—with only one trip in the hole. **Write or call: Halliburton Oil Well Cementing Co., Duncan, Okla., for details on cup-type bridge plug.**

●



Valve operates as plug and check

. . . types to handle numerous jobs. Called the Plugaroo, the valve has been under exhaustive field tests for 6 months. Results indicate it's economical and practical in drilling, production, pipelining, LPG, and secondary recovery, the maker reports.

The device is a nonlubricated plug valve which opens and closes with a quarter turn. In the open position it acts as a synthetic-seal check valve. The clapper is hinged vertically on a 20° angle and seals by its own weight. The valve comes in a 2-in.

Send this **Showcase Coupon**

to the Manufacturer of the item in which you are interested. See name, address, and equipment name and/or model, in bold-face type at end of description.

NAME AND/OR MODEL NUMBER.....

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Described in OIL AND GAS JOURNAL - Issue of August 18, 1958

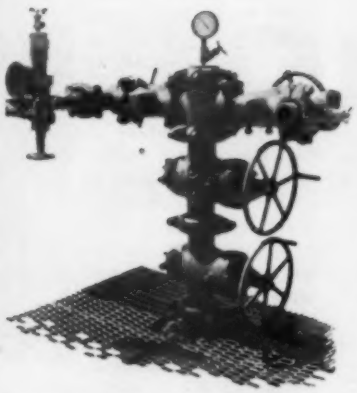
NAME.....TITLE.....

COMPANY.....

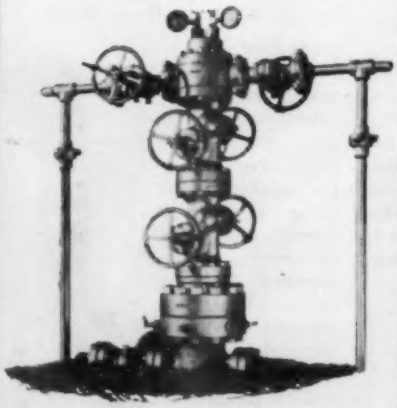
ADDRESS.....

CITY.....STATE.....

DATE.....



This Well Control System is now in service in West Texas.



Dual Master Valve for parallel completion now in service in Oklahoma.

COMPLETE CONTROL

for any depth, any pressure

Gray wellhead assemblies mean complete control . . . **complete** safety. That's because Gray Well Control Systems are designed for safety . . . engineered for safety . . . built for safety.

Simplification of design gives maximum flexibility and positive, efficient handling of every well control problem. Parts are creatively engineered to reduce the areas subject to pressure, provide more strength with less weight. Manufacturing is done by thoroughly trained, experienced men in the most modern, best equipped facilities available. Tooling, assembling and testing are backed by 35 years of consistent pioneering in the development of the best in well manifolds. Altogether, it means **complete** control at any depth or pressure.

Gray Well Control Systems . . . **complete control with complete safety.**

For additional information see the Gray Tool Company Catalog in Composite Catalog or write, wire or phone

This 30,000-pound Test System now in service in Louisiana.

GRAY *Tool Company*

P. O. BOX 2291 HOUSTON 1, TEXAS REpublic 4-1641

G 5802

size with working pressures of 200 and 500 psi. It's made of semisteel and has threaded ends. **Write or call: Frank Wheatley Supply Co., 125 West First Street, Tulsa, for details on Plug-aroo valve.**

●

Casing guide eases pushing

. . . of drag section through casing on highway crossings. It thus offers a solution to one time-consuming, expensive job in pipeline construction. Called the Maloney Texas Steer, it eliminates the delay and expense commonly encountered—hanging up or breaking of insulators—during the drag, the maker claims.

Basically it's a funnel, hinged along the back. The device is easily lowered into place on the casing end with a side boom. Breakover bolts allow it to be clamped tightly in place.

The small end of the funnel provides a flush, butt-joint with the casing end. Field proven on actual construction jobs, it is available in all casing sizes. **Write or call: F. H. Maloney Co., P. O. Box 1777, Houston 1, for details on Texas Steer casing guide.**

Send this **Showcase Coupon**

to the **Manufacturer** of the item in which you are interested. See name, address, and equipment name and/or model, in bold-face type at end of description.

NAME AND/OR MODEL NUMBER.....

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Described in OIL AND GAS JOURNAL - Issue of August 18, 1958

NAME.....TITLE.....

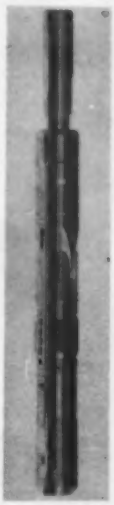
COMPANY.....

ADDRESS.....

CITY.....STATE.....

DATE.....

Packer allows circulation



. . . through bore to clean a well. The tool is designed to function under pressure differentials and high temperatures. A 28-ft. stroke allows spacing in the tubing head, eliminating pup joints. The long stroke also allows movement of the tail pipe which permits fluid flow to the bottom of the tail pipe, either through the tubing or by reverse circulation.

An automatic bottom is incorporated. It requires seven or eight turns to disengage. It's easily reengaged by raising the tubing string.

Use of the automatic bottom in the Type E packer eliminates the possibility of disengagement, causing premature setting. **Write or call: Houston Oil Field Material Co., Inc., P. O. Box 2589, Houston 1, for details on Type E packer.**

●

Safer tube pulling now possible

. . . with this new tubing bleedoff assembly for sanded up or plugged tubing, according to the maker. One cause of danger during pulling operations is the pressure trapped between bridges in the tubing. The bleedoff assembly minimizes this hazard by giving continuous control over the well and the pressure and fluid in the tubing.

It thus helps prevent the tubing from blowing out of the hole. And it keeps the rig floor clean when the tubing unloads. Also the tool is a means for directing produced fluid to a storage area and provides a means of circulation to control or kill a well.

Basically, the tool is a pressuretight mud box with seals that hold in both directions.

A square bottom plate on the tool fits the rotary table. It is internally machined to accommodate standard tubing slips. **Write or call: Brown Oil Tools, Inc., 2216 Campbell, Houston 10, for details on tubing bleedoff assembly.**

NICOMO 1.

A new hydrogen treating catalyst

leads the way!

8%

more desulfurization

No other hydrogen treating catalyst desulfurizes as well as new NICOMO 1. (NICOMO 1. maintains a commercially-proved 8% superiority in desulfurization activity.) No other catalyst offers such a major cost saving. (Because of lower bulk density, you need fewer pounds of NICOMO 1.) Full information in a new booklet. Write on company letterhead for your copy. Or see The Man From Davison.

W.R. GRACE & CO.
DAVISON CHEMICAL DIVISION
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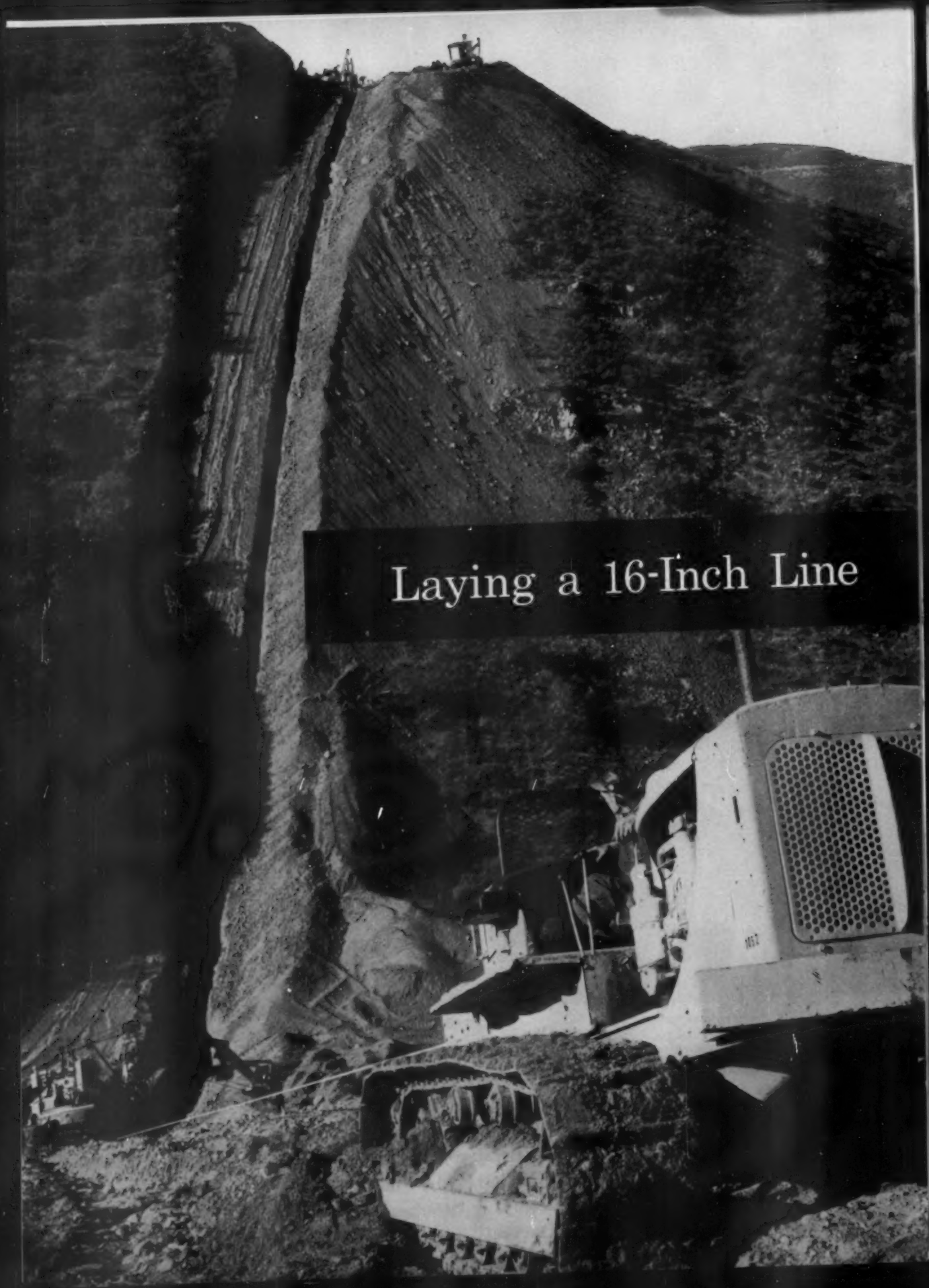

Laying a 16-Inch Line

FIRING LINE — Two MD7s raise the pipe for welding. On the job is a Cat Twin Arc-Welder mounted on a D7 while a D6 pulls another welder mounted on a track wagon.

CAT NO. 583 PIPELAYER AND MD7 with adjustable counterweights team up for R. H. Fulton for doping and wrapping near Twenty Nine Palms, Cal.

Practically Straight Up

R. H. Fulton put 165 men and a Caterpillar spread to work on Section 5, where young mountains and 80% slopes had to be crossed

Winching is a standard operation on Section 5, part of a 635-mile crude oil line from Farmington, N. M., to Long Beach, Cal. Experienced pipeliners report that this section has some of the roughest terrain they ever encountered. Using a spread of Caterpillar equipment, R. H. Fulton & Co. is laying 2 miles each 10-hour day on their portion of the line.

A fleet of sure-footed Caterpillar crawler Tractors —D7s, D8s and D9s—are doing the pioneering work. Equipped with bulldozers and rippers, they 'doze a load down one of the steep grades and are pulled back by a D8 with a Hyster winch. The ditcher is pulled up the young mountains by the winch on a D8 and let down the far side.

Filling out the spread on this section are four Cat Twin Arc-Welders, nine Pipelayers and a No. 12 Motor Grader.

On the toughest pipeline jobs throughout the world, Caterpillar yellow is always the predominant color of the equipment. Pipeliners know from field experience that wherever the pipe takes them, Caterpillar equipment will get them through.

CATERPILLAR TRACTOR CO., PEORIA, ILLINOIS, U.S.A.

Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

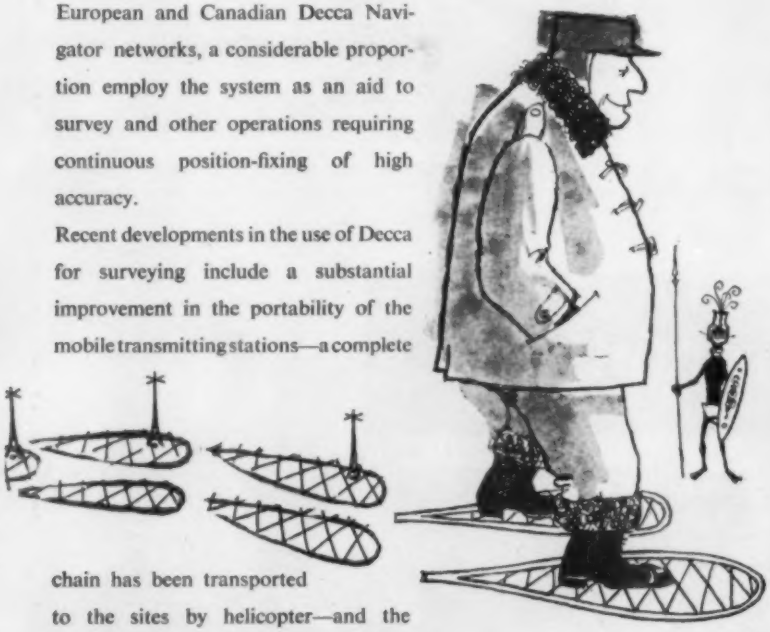
MAN-SIZED PIONEERING — Two giant D9s bulldoze and rip the rocky soil for the ditcher. One D9 is equipped with a Kelley Ripper while the second uses a matching No. 9 Ripper.

A LIFT FROM A D7 — A backhoe is winched up a 75% grade by a D7. Atop the hill in the back are two D8s with a winch and a Caterpillar MD7 with a pneumatic drill.

FROM NEWFOUNDLAND TO NEW GUINEA

. . . more than 20 mobile Decca chains are currently deployed to cover air, marine and ground survey and exploration projects. In addition, of the 4,300 ships and aircraft using the permanent European and Canadian Decca Navigator networks, a considerable proportion employ the system as an aid to survey and other operations requiring continuous position-fixing of high accuracy.

Recent developments in the use of Decca for surveying include a substantial improvement in the portability of the mobile transmitting stations—a complete



chain has been transported to the sites by helicopter—and the introduction of an automatic dead-reckoning element into the Decometer and Flight Log display systems. This device, already used with marked success in two air-borne geophysical surveys, eliminates the need for manipulation of the airborne receiver while in flight and the attendant risk of lane error; it also considerably increases the service-area of low-power transmitting stations under the radio noise-level condition encountered in the tropics.

THE DECCA NAVIGATOR

Mobile Chains for Exploration and Survey

THE DECCA NAVIGATOR COMPANY LTD., LONDON, ENGLAND

Dual-string pin packer sets easily

. . . as the upper packer in a dual-completion well using two strings of tubing for production. The Type DS packer is not only simple to set but full-opening for unrestricted production flow.

Compressor-type elements are used for packing off the upper production zone. Anchoring slips prevent high-compression loads on the tubing below the packer. It is completely retrievable by pulling the lower tubing. Upper tubing may be pulled any time without disturbing the packer. **Write or call: Texas Iron Works, P. O. Box 16068, Houston, for details on Type DS packer.**

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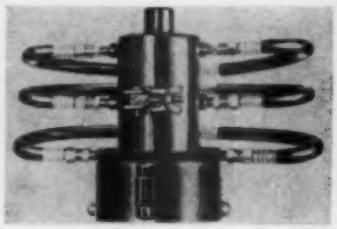


Drilling-line cleaner operates on air, water

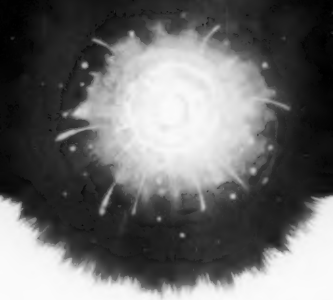
. . . or steam. Called Jet Away, it cleans thoroughly regardless of line speed and increases line life, the maker says. It will clean line and apply rust inhibitor in one operation. Cleaning action is accomplished by the forcing of air, water, or steam, through three funnel-shaped orifices. This produces a thin, high-velocity jet at each of the cleaning and drying ports.

It needs no rubbers or packing-nut assemblies. It will clean any type or size of line or cable, sand lines, conductor cables, and swabbing lines. The tool may be used to apply rust inhibitor or lubricant during respooling operations. It will keep polish rods on all types of pumping units clean. It's made of high-grade aluminum alloy, heat-treated and machined. At points of wear, nonsparking bushings are inserted.

The body is fitted with a fast-working lock for rapid closure around the line or rod. It is simple to install on top of drill pipe, wellhead, or lubricator. **Write or call: Bowen Itco, Inc., P. O. Box 4587, Houston 13, for details on Jet Away line cleaner.**

SCHLUMBERGER

THE MOST POWERFUL 5" NO-PLUG SHAPED CHARGE GUN IN THE WORLD



Here is power at your call when you need it for those big-casing tough jobs. In heavy pipe backed by hard rock or thick cement annulus, this extra-drive Schlumberger shaped charge pays off.

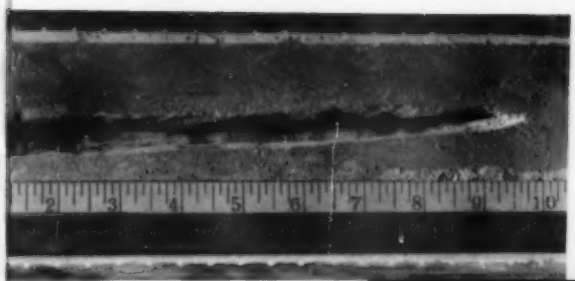
HIGH FLOW INDEX—Schlumberger bimetallic-liner charge eliminates hole-stopping slug and debris.

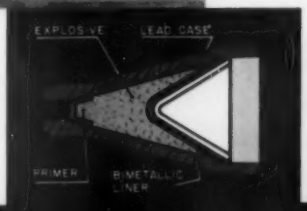
DEEPEST PENETRATION—plus increased hole size gives 80% more hole volume in standard Berea sandstone flow laboratory target, with a big ½" entrance hole.

LOWER COST—Selective bank firing covers two separate intervals on one trip in hole.

HIGH PRESSURE AND TEMPERATURE RATINGS—Shoots effectively and safely at 20,000 PSI and 350° F.

This is the gun that completes the battery of Schlumberger shaped charge perforators—maximum performance from a 1⅜" tubing gun to this rugged 5" steel carrier. Let your Schlumberger representative help you fit the right gun to the job.





THE EYES OF THE OIL INDUSTRY®

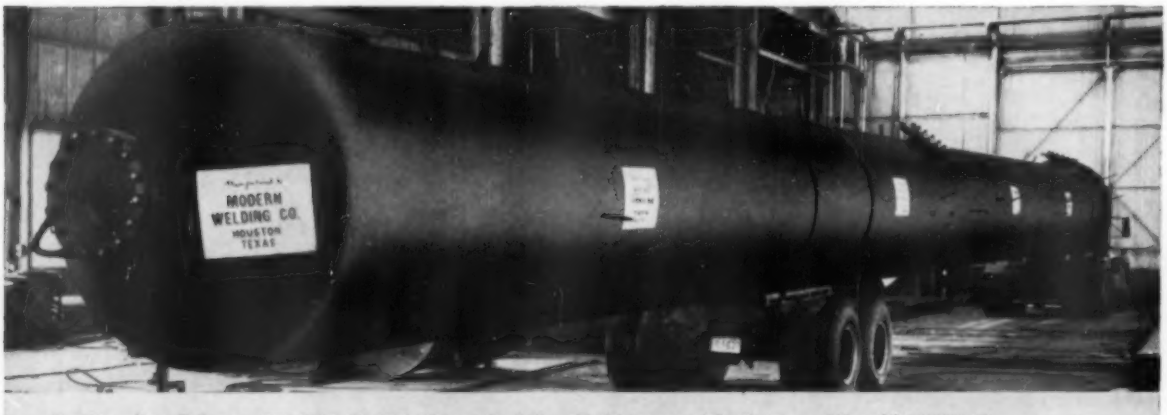
SCHLUMBERGER

For Custom Plate Fabricated

CODE TANKS and PRESSURE VESSELS

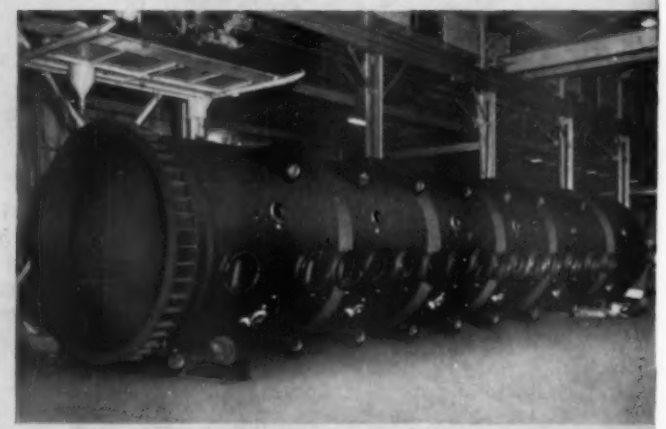
there is no substitute for *Experience*

Modern Welding Company offers a wealth of experience in plate fabrication. Five well equipped Modern Welding Plants are strategically located to serve the Chemical Processing and Petroleum Industries. All plants are equipped to handle vessels that require exacting specifications.



Fractionating Column—72" Dia. X 110'-0" length, ¾" wall thickness with 40 trays. All welds 100% X-ray quality. Constructed for internal pressure and full vacuum. Stamped A.S.M.E. Code. Total weight 83,000 lbs.

Heat Exchanger — Lower Section 4'-0" dia. X 14'-0". Upper Section 1'-8" dia. X 10'-0". ⅝" Carbon Steel Plate Wall. A.S.M.E. Code construction using tube bundle of schedule 160 pipe.



Styrene Stripping Column—9'-6" Dia. X 80'-0" length, ½" plate walls and ⅝" heads. Constructed and stamped A.S.M.E. Code. Vessel contains 14 stainless steel perforated trays, 16 manways, 146 couplings, and nozzles. Total weight 72,000 lbs.

MODERN TANKS QUALITY

MODERN WELDING COMPANY

INCORPORATED

Owensboro, Kentucky

NEWARK, OHIO · ORLANDO, FLA. · HOUSTON, TEXAS · BURLINGTON, IOWA

Flare-stack pilot uses photo-sensing device

. . . for safety control. Called Ignito-Matic, the unit has been successfully used in several refinery installations, the maker says. It is also being used on pipelines and by gas transporters for gas purging.

With a fuel consumption of only 10,000 B.t.u. per hour, the burner and combustion chamber are designed to make the pilot stable in high-velocity winds. In event of flame failure, a scanner senses the infrared ray drop and instantly activates a high-voltage spark for reignition. The control can be wired into alarm or cutout devices.

Constructed of 316 stainless steel, it's available with explosionproof or weatherproof housing. Pushbutton control instead of electronic control is also available. The unit may be mounted either vertically or horizontally. **Write or call: Automatic Butane Gas Co., 4722 West Eighteenth Street, Houston, for details on Ignito-Matic flare-stack pilot.**

Analog computer

. . . for process plants offers high reliability by eliminating all vacuum tubes, relays, and servo-slidewires, the maker says. The computer can be used as an operational aid and as an optimizing controller in fractionating towers or distillation columns.

The computer accepts electrical input signals from standard instrument transmitters installed in the process loop. It performs computations designed to maintain output product at desired quality or quantity. The basis of the calculation is the feed-flow rate and product analysis. However, other inputs are readily usable. Distillation-

Structural steel can now be delivered promptly and when required.

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FOUR distinct divisions in **one** steel company, inter-related, specialists in their own field of endeavor and singly managed.

Some clients take advantage of all **four**, others one or more.

Fabricated Structural Steel and Fabricated Reinforcing Steel for Bridges, Commercial and Industrial Buildings: Schools, Hospitals, Power Plants, Coal Washing Plants.

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Pressure Vessels fabricated to the ASME Code from Carbon, Alloy, and Alloy Clad Steels for the Chemical and Petroleum Processing Industries.

for over 40 years

FLINT STEEL CORPORATION

TULSA . . . MEMPHIS

New Equipment

column output is computed by summing the product-line flows. Input signals are converted to their logarithms. These are then added, subtracted, or proportioned to compute products, quotients, or exponentials. The computer is enclosed within a moistureproof durable steel cabinet. **Write or call: Southwestern Industrial Electronics Co., 2831 South Post Oak Road, Houston, for details on new computers.**

Oil-well pump offers high capacity

. . . for 2-in. tubing. The new Volumax pump has a special ⅞-in. liner column that uses a ⅞-in. plunger to effectively seal and create an upper telescoping annulus. Resulting production is 22% more than that obtained with a tubing pump, the maker claims.

The pump may be operated at a depth limited only by sucker-rod stress. Tandem construction is used for rigidity during the compression portion of the downstroke. The pump is an insert type. So tubing need not be pulled. **Write or call: Axelson Mfg. Co., P. O. Box 58335, Los Angeles 58, for details on Volumax pump.**

●

Sucker-rod coupling is insulated

. . . to prevent electrolytic corrosion of sucker rods and pumps in pumping wells. Field tests show it ups rod life eight times, the maker claims. The insulation withstands bearing pressures above 75,000 psi. without rupture or deformation.

The unit has been X-rayed while under a 20,000-lb. pull. No deformation was observed. The coupling did not conduct during the test with 150-volt a.c. and d.c. power. It has also been tested with over 100-ft.-lb. of torque. It didn't turn or conduct.

Provision is made to eliminate wrenching through the coupling during rod pulling. Coupling material is SAE 4142 heat-treated steel. **Write or call: Mott Co., P. O. Box 1653, Houston 1, for details on new sucker-rod coupling.**

●

New flocculant gives high purity

. . . increased solution clarity, and greater product uniformity, the maker says. A polyacrylamide type of flocculant, it's called Separan NP10. It can be used as a flocculant in thickening and clarification processes in chemical processing and water treatment.

In water treatment it is used to improve the clarity of treated water and increase the settling rate of precipitated and suspended solids. It's also used to increase the throughput of exising equipment and decrease treatment costs.

A synthetic, organic, water-soluble polymer, it has uniform effectiveness over a wide pH range. A white amorphous flake, the flocculant is dissolved in a dilute aqueous solution and fed into the effluent to be treated. **Write or call: Dow Chemical Co., Midland, Mich., for details on Separan NP10.**

HOW TO STOP CORROSION OF OIL WELL CASING

The external corrosion of oil and gas well casing is a major headache to operators in many areas. It causes leaks, necessitates repairs, and can even reduce a well's deliverability.

Now, wells in most fields can be protected against external corrosion cathodically. Magnesium anodes or rectifiers are used to project current onto the casing to stop corrosion.

CSI engineers recently installed rectifier systems on 25 oil wells in Central Texas for a major oil company. They ran current requirement surveys; and furnished all necessary engineering, labor, materials, ditching machines, earth augers and other equipment. The turnkey job cost only about $375 per well.

Let CSI engineers help you. Call or write today for engineering and installation services or quality materials. Estimates or quotations without obligation. Ask for free copies of the new CSI reports on "Hot Spot Protection" and "Galvomag Anodes."

CSI

CORROSION SERVICES INCORPORATED
Tulsa, Oklahoma

P. O. Box 7343, Dept. J-17 Telephone: Circle 5-1351

Cementing and fracturing hose of steel, comprising Chiksan Joints and Weco Unions, have long been standard equipment with service companies.

new NEW

Chiksan has developed a new kind of swivel joint for oil well cementing. This joint has a wide turning radius and a new process-hardened steel to minimize cavitation and washout, plus a new wedge-shaped packing that cannot be sucked into the stream. It's called the Longsweep and it has produced highly spectacular results.

In two years of field testing, this new joint has proved itself better than any previous cementing joint ever used. Cementers report a minimum of 3-to-1 service life over old joints. This newest development is another Chiksan effort to reduce drilling costs.

CHIKSAN Longsweep SWIVEL JOINT

triples cementing hose service life . . .

CHIKSAN fmc

A SUBSIDIARY OF FOOD MACHINERY AND CHEMICAL CORPORATION

58-35

CHIKSAN COMPANY—Brea, Calif. • Chicago 5, Ill. • Newark 2, N. J. • Weco (Division), Houston 1, Texas • Subsidiaries: Chiksan Export Co. • Chiksan of Canada, Ltd.

SHOWCASE . . .

New Literature

Recommended practice for stress relieving

. . . welded attachments is presented in the newest publication of the Pipe Fabrication Institute. The new engineering standard is identified as ES(M) 10. It also refers to more detailed data for specific temperatures to be used in stress relieving of piping materials reviewed in Engineering Standards ES(M) 8 and 9. **Write or call: Pipe Fabrication Institute, One Gateway Center, Pittsburgh 22, for Engineering Standard ES(M) 10.**

Specialized offshore equipment

. . . is detailed in a new 20-page catalog. It includes big barge-spud jacks, rig-skidding jacks, yoke type of jacks, casing driver, and barge-setting equipment, as well as rig specialties. **Write or call: Joe Stine, Inc., P. O. Box 14471, Houston 21, for offshore equipment catalog.**

★ ★ ★ ★ MAXIM ANNOUNCES NEW LINE OF LOW COST AIR-JACKETED SILENCERS

Now it is more financially practical than ever before to ventilate as well as silence engine rooms. Maxim research has reduced the cost — while improving the efficiency — of air-jacketed silencers.

Maxim Air-Jacketed Silencers offer you a low cost "package" that combines noise suppression and ventilation . . . that avoids accidental burnings . . . that lasts years longer than conventional silencers and with less maintenance.

★ ★ ★ ★

THE MAXIM SILENCER COMPANY Subsidiary of Emhart Mfg. Co.
98 HOMESTEAD AVENUE, HARTFORD, CONN.
Please send me your bulletin on Air-Jacketed Silencers

Name

Company

Address

THE MAXIM SILENCER COMPANY
Subsidiary of Emhart Mfg. Co.
98 Homestead Ave., Hartford, Conn.

Fundamentals of Industrial Insulation

. . . is the title of a new 16-page handbook. The bulletin presents in a practical and simple way some of the field problems involved in industrial insulation. General fundamentals of insulation are covered. Special considerations of high and low-temperature insulations are included. **Write or call: Aber Co., 4832 Almeda Street, Houston, for Fundamentals of Industrial Insulation.**

Dynamic-adsorption-unit catalog

. . . includes graphic diagrams showing typical applications of DAU units now in service. Complete specification tables are given for both the DAU Type I Weldrier for dehydration and for the DAU Type II Welsorber for dehydration and hydrocarbon recovery. **Write or call: Parkersburg Rig & Reel Co., P. O. Box 12007, Fort Worth, for DAU catalog.**

Metering and testing equipment

. . . Catalog C-558 describes in detail metering separators, Vol-U-Meters, well testers, metering free-water knockouts, and Weight-O-Matic meters. The eight-page bulletin features cross-sections and data on sizes and capacities. Applications, advantages, construction, and operation are cited. **Write or call: Oil Metering & Processing Equipment Corp., 4843 Yale Street, Houston 18, for Catalog C-558.**

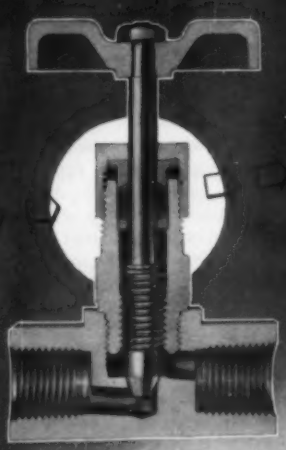
All-metal shoes and collars

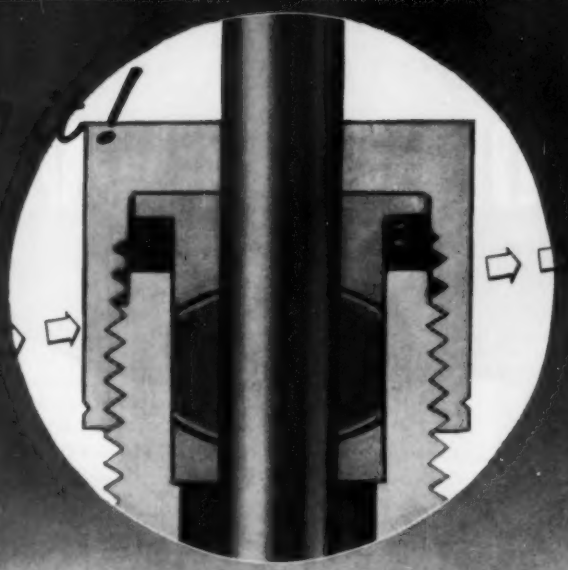
. . . and other cementing equipment are described in new Bulletin C-58. The catalog includes operating and performance data on Type A cementing shoes and collars and Type O fill-shoe and collar that permits the operator to switch from filling to circulating and back to filling again. It also details the Type T two-plug stage cementer, Type E cementing head, and other special equipment. **Write or call: Rector Well Equipment Co., Inc., 1100 North Commerce, Fort Worth, for Bulletin C-58.**

Combination power package

. . . for starting emergency standby power engines is described in new Bulletin AR-101/58. It tells how the charger-battery combination can be installed in minimum space alongside standby emergency power engines. The charger comes complete with drip-proof housing for wall or floor mounting. Curves and diagrams illustrate

Marsh has it!





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416 Stainless Steel

Needle Throttling Valves

- Body and stem guide machined from bar stainless steel stock
- Valve Stem hardened stainless
- Fine stem threads for extra strength and precision throttling
- Deeper inlet and outlet chambers
- Bodies made in accordance with MSS regulations
- Packing "Marpak" system incorporating "Teflon" as described opposite

The Marpak Packing System

—*now with fabulous*

"TEFLON" PACKING

An outstanding feature of the Marsh Needle Valve has been the Marpak Packing System. This unique method of obtaining a tight, but non-binding seal is one of the important reasons for the ability of Marsh Valves to give precision regulation at any pressure up to 10,000 psi.

Now the Marpak system has been made still better by the use of today's miracle material—"Teflon." You probably know of the almost incredible toughness, resilience and non-adhesive properties of Teflon—properties that are unimpaired by the most powerful of solvents, acids, or alkalies, even at temperatures up to 500° F.! As a result of incorporating "Teflon" packing, Marsh Stainless Steel Needle Valves are now

Guaranteed for any pressure up to 10,000 psi at any temperature up to 500° F.

In other makes of valves permissable temperature *decreases* as pressure *increases*—but not with Marsh.

Teflon packing is one more addition to the list of features that are combined only in Marsh Stainless Steel Needle Throttling Valves. Note the list opposite...ask for bulletin.

MARSH INSTRUMENT CO. *Sales Affiliate of Jas. P. Marsh Corp.*, Dept. L Skokie, Ill.
Marsh Instrument and Valve Co. (Canada) Ltd., 8407 103rd St., Edmonton, Alberta
Houston Branch Plant: 1121 Rothwell St., Sect. 15, Houston, Texas

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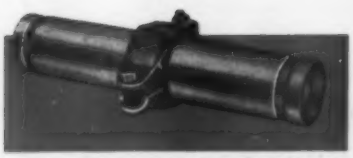
GUSTIN-BACON
ROLL-A-GROOVE
FOR GROOVING THE NEW, ECONOMICAL
LIGHT WALL STEEL OR ALUMINUM
PIPE AND TUBING

SO EASY TO OPERATE—PORTABLE . . .
In a matter of seconds, in the field or shop, by hand or power, a groove can be rolled in 2" to 6" IPS light wall pipe.

RUGGED . . .
cast of malleable iron for complete portability and long trouble free usage.

FOOLPROOF . . .
unique roller design prevents walkoff and slippage . . . no groove measuring or gauging required.



For Use with G-B Gruvagrip, Gruvajoint, Rigi-Grip or Other Similar Grooved Pipe Couplings and Fittings.

Does Not Weaken or Work Harden Pipe Ends. Under Extreme Pressure This Pipe Burst, But Grooved Ends Did Not Shear Off or Swage Down.

Pat. Pending

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GUSTIN-BACON Manufacturing Company
2310 W. 10th St., Kansas City, Mo.

discharge and charging characteristics of the combination from the time the engine demands starting power until the battery reaches full charge again. **Write or call C & D Batteries, Inc., Washington & Cherry Streets, Conshohocken, Pa., for details on combination power package.**

Flangnek standard meter tubes

. . . are described in new 20-page Catalog Section D. Formerly custom items, meter tubes can now be ordered as standardized components of oil and gas flow-measurement systems direct from the catalog. Only size, catalog number, and plate bore are needed to order. Units with either Senior or Simplex orifice fittings are in stock in 2 to 6-in. sizes, with pressure ratings of 150, 300, and 600-lb. ASA. It includes data on orifice flange meter tubes, three section units, high-pressure meter tubes, special end modifications, complete metering stations, power-station units and special materials, metering station accessories, and design information. **Write or call: Daniel Orifice Fitting Co., P. O. Box 19097, Houston 24, for Catalog Section D.**

Well-logging methods review

. . . is published by Schlumberger Well Surveying Corp. Called Document 8, it's intended as a text for those who wish to make a study of logging methods. The various logging services offered by the company are discussed in some detail, together with essential methods of interpretation. The discussion is simple and clear, with a minimum of mathematics. A comprehensive bibliography is included in the up-to-date review. **Write or call: Schlumberger Well Surveying Corp., P. O. Box 2175, Houston, for Document 8.**

Cast and forged-steel valves

. . . are described in new, comprehensive, 92-page Catalog 14. The valves are indexed by type, functions performed, and maker's figure numbers. All the company's standard valves are shown. Typical applications of major valve types are illustrated. One section shows curves and formulas for correlating valve size and pressure drop. Data include ASA dimensions, ASA pressure-temperature ratings, and ASTM basic materials specifications. Condensed rating tables appear on each page next to the valve listings. **Write or call: Edward Valves, Inc., subsidiary of Rockwell Mfg. Co., East Chicago, Ind., for Catalog 14.**

Genesys Corp. announces

. . . its entry into the field of industrial process control. It will manufacture and develop commercial digital control computer systems as well as a supporting line of proprietary nucleus products. Product development will be headed by J. P. Lekas, vice president. Systems engineering will be headed by

J. P. Lekas

G. Post

J. F. Davis

Geoffrey Post, vice president. Marketing activities will be under the direction of J. F. Davis, vice president. Lekas previously was with Litton Industries and North American Aviation. Post has been with Allen B. DuMont Laboratories, Servomechanisms, Inc., and Litton Industries. Davis has also been with Litton and Neely Enterprises.

Roy E. Mullin assigned

R. E. Mullin

. . . as general sales manager of D. W. Onan & Sons, Inc., Minneapolis, reports C. W. Onan, president. Mullin replaces Hiram Hascall, who will retire at the end of this year. Mullin was vice president in charge of sales and marketing for a large automotive manufacturing company. His experience there included both domestic and export markets for commercial products through a distributor-dealer distribution system, sales to original equipment manufacturers, and specialized markets.

Solar Aircraft Co. names

. . . four sales firms as new representatives for its industrial bellows and expansion joints, W. F. Briney, manager, industrial products sales, reports. They are: The Condit Co., Tulsa, in Oklahoma, the western half of Missouri, and the Panhandle of Texas; The T. F. Fitzgerald Co., Boston, Mass., the New England states with the exception of Connecticut; Bass Industrial Equipment Co., Buffalo, N. Y., northwest section of New York and several counties in northern Pennsylvania; and Bass Industrial Equipment Co., Ltd., Toronto, Ont., the provinces of Ontario and Quebec.

J. R. Trayler assumes new post

. . . as a member of the field sales staff representing Brodie meters in the northern California division, according to D. S. Johnson, general sales manager of Ralph N. Brodie Co. During over 20 years with Brodie, Trayler has held positions of chief inspector, assembly superintendent, service manager of eastern division, and various sales capacities.

Brown Oil Tools, Inc., sets up

. . . a new field pipe testing division at its Houston headquarters with E. L. Potts as superintendent. Potts and his staff are making a thorough study of present testing equipment and testing procedures to evaluate those in the light of today's well completion techniques. Post has been with Brown since 1949. He was formerly with Halliburton Oil Well Cementing Co.

Dollinger Corp. appoints

. . . Robert P. Thomsen as sales manager, according to Lewis L. Dollinger, Jr., president. Thomsen succeeds Dollinger. Previously, Thomsen had been advertising manager. He joined Dollinger in September 1952.

G. V. Leece presents

. . . 10 shares of Gardner-Denver Co.'s stock to John Bent, winner of the company's world-wide centennial slogan contest. Leece is president of Gardner-Denver. Bent is an engineer employed at the West Coast fabricating division at Whittier, Calif. Looking on is E. Vincent Erickson, executive vice president and chairman of the centennial observance in 1959.

Seven appointments announced

. . . by Baroid Division, National Lead Co. R. E. Souther was named manager of foreign operations. Replacing him as manager of the well logging department is B. O. Pixler, formerly assistant manager. In the drilling mud

R. E. Souther

B. O. Pixler

department, H. I. Bussa, formerly assistant manager of the lower Texas Gulf Coast area office, becomes ad-

H. I. Bussa

B. F. Stiba

ministrative assistant to the manager. B. F. Stiba, formerly sales representative in the east Louisiana area, was appointed sales manager in the lower Texas Gulf Coast area at Houston. Kemp S. Lewis replaced Bussa as assistant area manager, lower Texas Gulf Coast area. S. E. Geffen becomes area superintendent of the well logging department in Denver, Colo., replacing Wendell H. Russell, who returns to the Houston general office as assistant manager of the well logging department.

Four vice presidents named

. . . to new responsibilities at The Ramo-Wooldridge Corp., Los Angeles, according to Dr. Dean E. Wooldridge, president. Dr. Ralph P. Johnson, formerly vice president, research and development, has been named group vice president in charge of the general electronics group of divisions. Dr. Burton F. Miller, formerly vice president and director of the communications division, becomes vice president and director of advanced systems planning. Milton E. Mohr, formerly vice president and director of the control systems division, has been named vice president, engineering. Irwin A. Binder, vice president, man-

ufacturing, will have direct responsibility both in Denver and Los Angeles for the activities of the manufacturing division.

D. L. Sprung appointed

. . . assistant sales manager of Alberta Phoenix Tube & Pipe, Ltd., according to W. T. Hayward, sales manager. For the past 5 years Sprung was with McIntosh Supply, Ltd. and McIntosh Distributor Equipment, Ltd. in Vancouver and Calgary. Prior to that, he spent several years with Canadian Liquid Air Co., Ltd.

Kaiser Steel Corp. names

W. W. Peters

. . . Walter W. Peters to the sales staff of the Tulsa sales office, reports C. L. Emerson, general sales manager. He replaces Robert E. Brown, who transfers to Houston. Before joining Kaiser Steel's sales department in 1954, Peters was a partner in a building contracting firm.

Oilwell appoints two

L. Hamilton Shaw is named assistant district engineer at Farmington, N. M., for U. S. Steel Corp.'s Oil Well Supply Division, reports R. L. Armstrong, Rocky Mountain area manager. Ivan A. Jones becomes field representative at Wewoka, Okla., according to Mark Barkhurst, Mid-Continent area manager. Shaw joined the division in 1957 at Corpus Christi, Tex., and Jones joined in 1948 at Great Bend, Kans.

Ranna and Baccich promoted

. . . by A. M. Lockett & Co., Ltd., sales subsidiary of The Babcock & Wilcox Co., according to R. P. Lockett, Jr., vice president. J. J. Ranna becomes manager of the New Orleans district sales office, succeeding G. R. Hammett. G. M. Baccich, Jr., resident sales engineer in Baton Rouge, La., replaces Ranna as assistant manager of the New Orleans district office.

Robert A. Smith promoted

. . . to manager, advertising and promotion section, tar products division, Koppers Co., Inc. He succeeds F. P. Cooney. Smith joined Koppers Central staff marketing department in 1956 and was named account supervisor of advertising and sales promotion for the tar products division in 1958.

This geophysical equipment to be used in Libyan Desert

. . . is built by Griffin Tank & Welding Co., Dallas, Tex. All units are being installed on 4-wheel drive International diesel trucks. Special oversized wheels with 12-ply nylon aircraft type tires provide low pressure traction in the desert sands.

Melvin A. Finuf boosted

M. A. Finuf

. . . to the staff of the executive vice president of The J. B. Beaird Co., Inc., as marketing assistant, according to J. L. Tullis, executive vice president. Finuf will perform a key staff roll in the planning and execution of the company's program of market expansion. He joined Beaird in 1935. He has formerly served the company as assistant sales manager and assistant general sales manager.

Lunkenheimer Co. transfers

V. P. Mahon

. . . Vincent P. Mahon, sales representative in Houston, to branch manager at Boston, Mass., according to Melvin W. Pauly, vice president in charge of sales. Mahon is a member of the American Society of Mechanical Engineers. Lunkenheimer is a manufacturer of valves.

Cecil C. Scott named

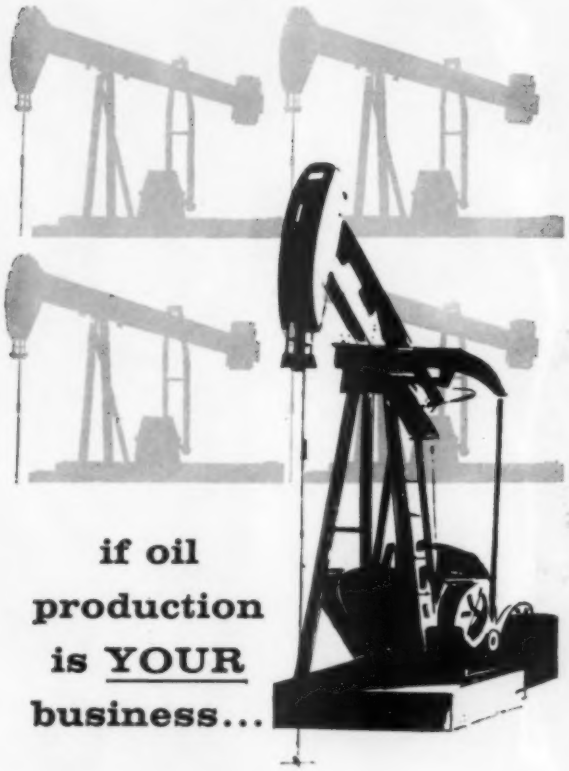
. . . president of Diamond Oil Well Drilling Co., Midland, Tex. Prior to joining Dowdco as president and as a member of the board of directors, he was regional manager of Security Engineering Co. in Dallas. He was with Security from 1946 until his present position at Dowdco.

AOSC moves its headquarters

. . . from Odessa, Tex., to Dallas, Tex., according to J. F. McAdams, Hobbs, N. M., president of Association of Oilwell Servicing Contractors. The decision to make Dallas the new home office was determined after surveys of AOSC members disclosed that a more central location was needed. James E. Danheim, executive secretary, will be in charge of the new office. The association, founded in West Texas in 1956, has grown into a national organization with chapters in seven southwestern states.

Third annual meeting held

. . . by the Appalachian Underground Corrosion Short Course at the West Virginia University, Morgantown, W. Va. It was attended by corrosion engineers and technicians from 29 states and Canada. New officers for the coming year are: General chairman, C. L. Dey, Koppers Co.; program chairman, C. M. Ruttter, Jr., Equitable Gas Co.; publications chairman, T. W. Watson, Socony Mobil Oil Co.; exhibits chairman, G. G. Campbell, West Virginia University; publicity chairman, J. H. Alm, Dearborn Chemical Co.; and registration chairman, R. E. Hanna, Jr., West Virginia University. Pictured are: General Chairman Dey, Publicity Chairman Alm, and Program Chairman Rutter.



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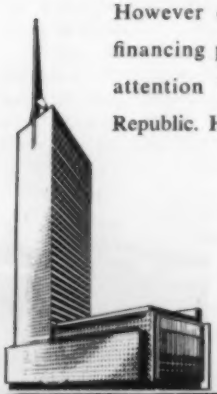

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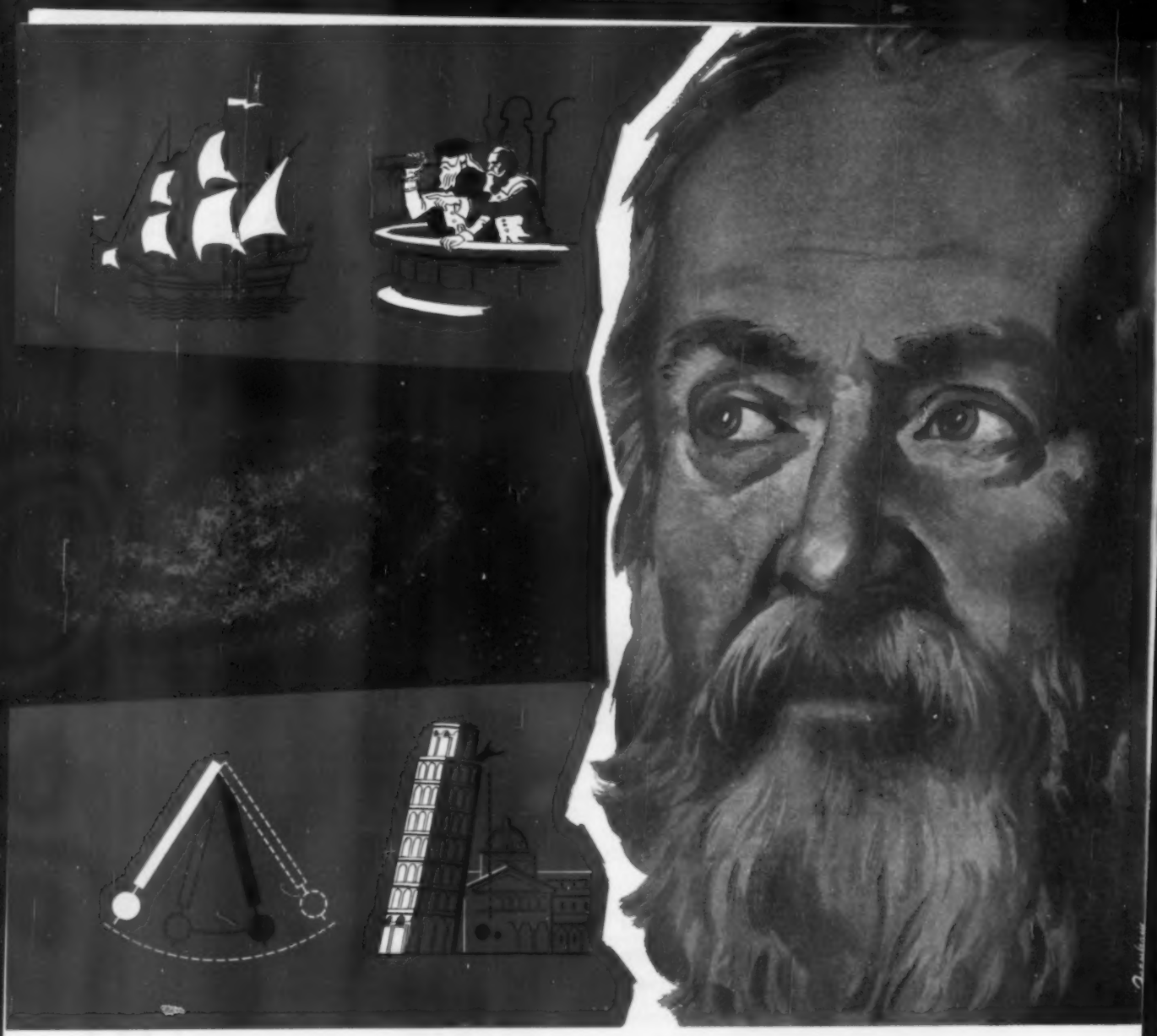
Manufacturers of submergible motors and pumps for over 35 years — for oil, brine and water wells, gasoline and jet fuel —



Scientific Coordination. Galileo coordinated the knowledge of his day to produce thought changing data for modern science. General Geophysical has coordinated its manufacturing, laboratory, and field exploration facilities to produce *accurate data* for its clients' decisions. General's engineers design and build reliable recording equipment that is easily serviced in the field. The laboratory tests, *then retests* each unit for precision performance. General's field crews are fully informed personnel, trained to proficiently operate and maintain the equipment they use. With General's coordinated geophysical services on the job *you know* that your reference data are exactingly correct.

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WHEN YOUR CONTRACT IS WITH GENERAL, THE PERCENTAGE FOR SUCCESSFUL EXPLORATION IS IN YOUR FAVOR

WILDCAT ACTIVITY blankets all of Canada, as test wells go down in the Maritimes, the Northwest Territories, and on the islands off the west coast.

Canadian drillers broaden their horizons . . . and look both east and west

BY FRANK J. GARDNER

THIS ANNUAL Canadian Number of the Journal reflects an important new approach to Canadian exploration. Previously the western provinces have drawn most attention, but today we see interesting wildcat activities from coast to coast.

In this issue you will find some exclusive first-published studies on some of these new theaters of operation. Among these are the Queen Charlotte Islands off the west coast of British Columbia, the Peace River country of northeastern British Columbia, the prolific new Swan Hills region of western Alberta, and way to the east, the Maritimes region of eastern Canada. Another "new look" region, now reflecting greater activity than ever before, is southwestern Ontario.

Far to the west . . . Perhaps the most interesting of all these operations are those in the Queen Charlotte Islands. Here a six-wildcat search has already been started by Richfield Oil Corp. These islands lie about 400 miles northwest of Vancouver and 750 miles southeast of Richfield's recent oil strike on Alaska's Kenai Peninsula. The islands are separated from the mainland by Hecate Strait. There are five main islands with a total area of 3,970 sq. miles. Of the five, Graham Island is the most likely to produce oil, and it is here that Richfield's program is under way.

Why all this optimism about these remote islands? Some of the answers may be found in C. Warren Hunt's new paper on page 136 of this issue. On a broader basis, it might be well to say that geological thinking points to a definite connection between the Alaskan Kenai country and the Queen Charlotte Islands. The Gulf of Alaska basin arcs in a semicircular fashion from Kenai eastward and southward down through the Yakutat country, southeastward through the Chicagof Islands, the Baranof Islands, and the Prince of Wales Islands of the Alaskan panhandle.

We can thus envision a vast elongated arena for possible future exploration. And if Richfield should hit at one of its Queen Charlotte wildcats, this most certainly would set off such a program.

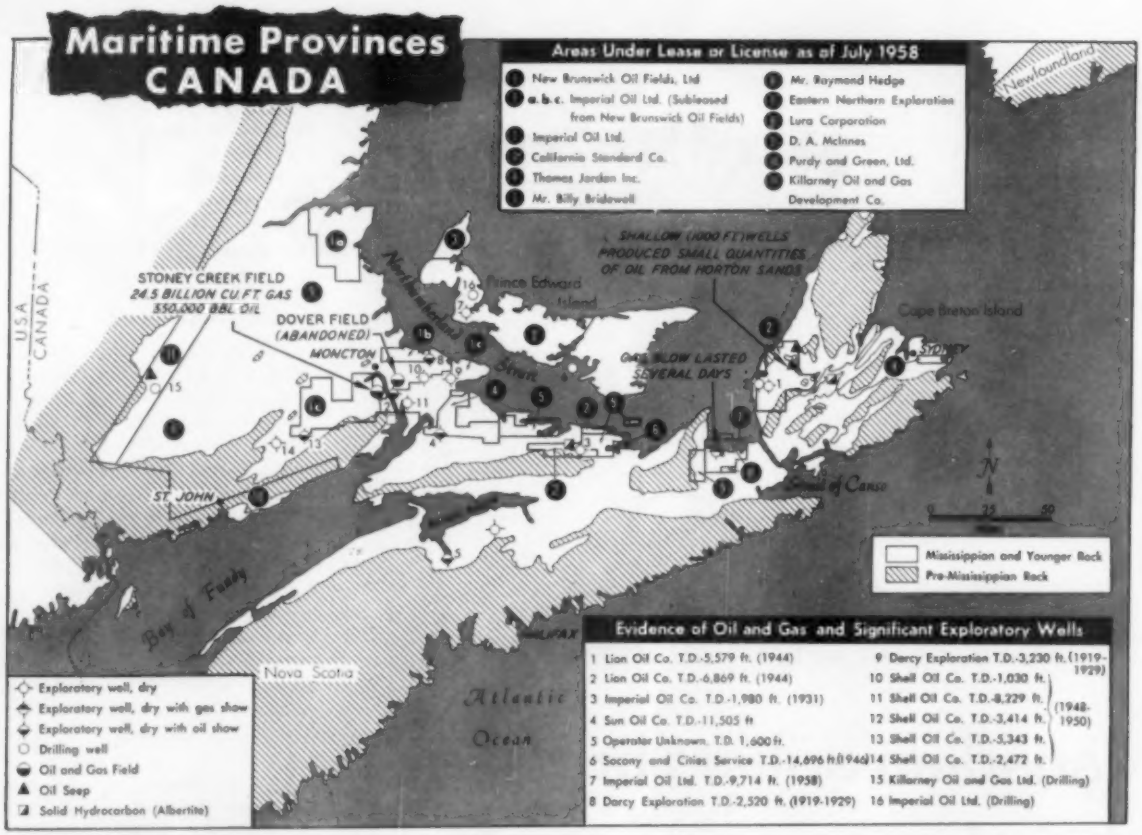
Across the plains . . . Two articles in this issue, both original studies, spotlight a couple of the most active new major oil plays in Canada today.

In a study of the regional geology of northeastern Columbia, Author G. L. Gray paints an encouraging picture of a vast new oil and gas domain still in its infancy.

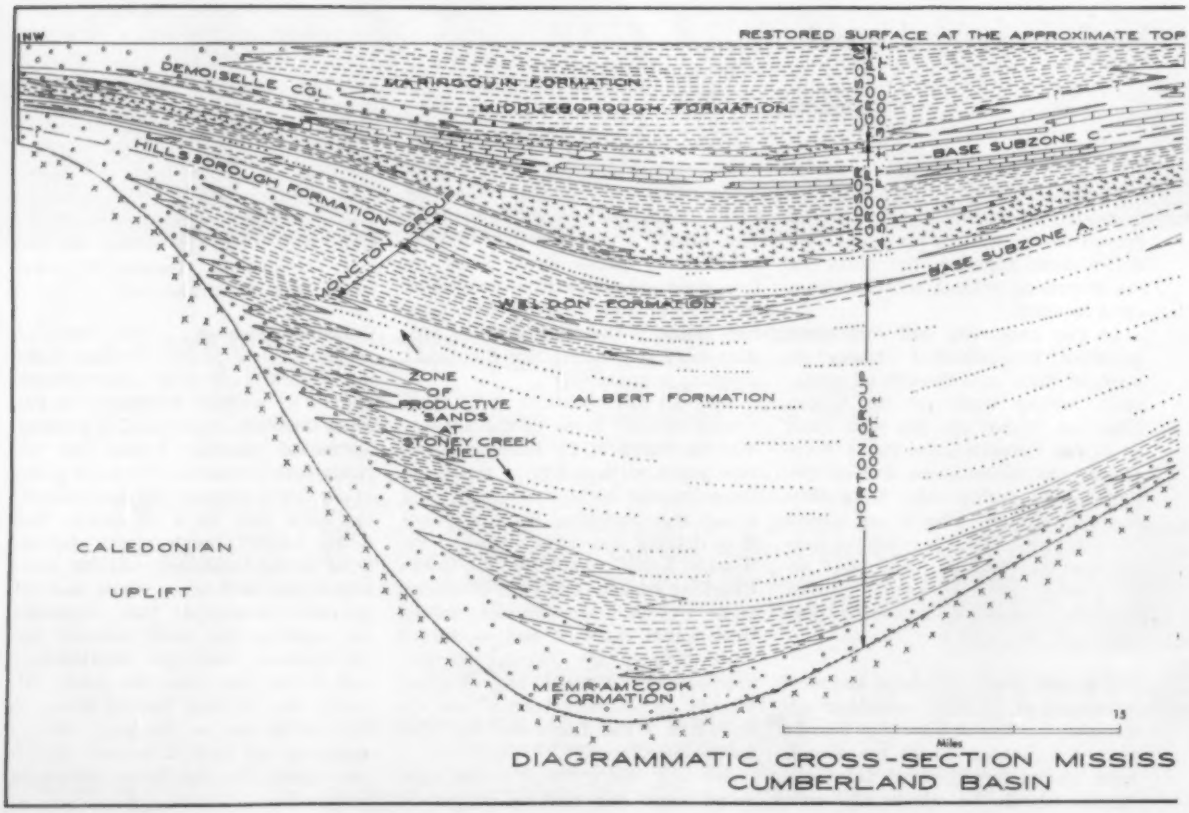
Home Oil Co. is publicly enthusiastic about the Swan Hills region of Alberta. "The high rate of discoveries and substantial shows in the Beaverhill Lake reef over an area of about 3,500 sq. miles . . . indicates that a most important hydrocarbon subprovince has been discovered." No doubt, in the next 5 years, wildcat activity in western Alberta's hills will prove this statement to be on the conservative side.

And clear to the Atlantic . . . Jumping clear across the continent to the Maritime provinces, we find another wildcatter's delight. Author Bill Shaw has done a lot of field work in the Maritimes and he is enthusiastic about the possibilities. The recent abandonment of Imperial Oil, Ltd.'s, second wildcat on Prince Edward Island tends to emphasize the negative there, but Shaw's description of the Maritime geologic conditions certainly justifies his final conclusion that "the Maritime provinces are due for an intensive and sustained exploration effort. Here is a challenge worthy of the most competent, resourceful, and imaginative explorationists."

Canadians push on . . . So Canada is expanding its exploration efforts from the western plains to its eastern shores and to its western extremity. In another direction, exploration is pushing northward into the Yukon and the Northwest Territories. It's rough going in the north country and the wildcatting pace may be a bit slower. But severe weather, rough terrain, and adverse living conditions will be overcome, and we'll see a whole new oil province developed. New highways are opening the north country for the explorer, and new conveniences will follow him into the wilds. Already, the Modern Beauty Salon in Whitehorse has set the pace; with a small sign out front, it reserves its Friday nights. The sign reads "Men only tonight."


Maritime Provinces
CANADA
Areas Under Lease or License as of July 1958
New Brunswick Oil Fields, Ltd
a. b. c. Imperial Oil Ltd. (Subleased from New Brunswick Oil Fields)
Imperial Oil Ltd.
California Standard Co.
Thomas Jordan Inc.
Mr. Billy Bridewell
Mr. Raymond Hedge
Eastern Northern Exploration
Lura Corporation
D. A. McInnes
Purdy and Green, Ltd.
Killarney Oil and Gas Development Co.
Newfoundland
SHALLOW (1000 FT) WELLS PRODUCED SMALL QUANTITIES OF OIL FROM HORTON SANDS
STONEY CREEK FIELD
24.5 BILLION CU FT GAS
550,000 BBL OIL
DOVER FIELD (ABANDONED)
MONCTON
GAS BLOW LASTED SEVERAL DAYS
Prince Edward Island
Cape Breton Island
STONEY
USA
CANADA
ST JOHN
Bay of Fundy
Nova Scotia
Atlantic Ocean
Gulf of Canso
N
0 25 50
Mississippian and Younger Rock
Pre-Mississippian Rock
Exploratory well, dry
Exploratory well, dry with gas show
Exploratory well, dry with oil show
Drilling well
Oil and Gas Field
Oil Seep
Solid Hydrocarbon (Albertite)
Evidence of Oil and Gas and Significant Exploratory Wells
1 Lion Oil Co. T.D.-5,579 ft. (1944)
2 Lion Oil Co. T.D.-6,869 ft. (1944)
3 Imperial Oil Co. T.D.-1,980 ft. (1931)
4 Sun Oil Co. T.D.-11,505 ft
5 Operator Unknown. T.D. 1,600 ft.
6 Socony and Cities Service T.D.-14,696 ft. (1946)
7 Imperial Oil Ltd. T.D.-9,714 ft. (1958)
8 Darcy Exploration T.D.-2,520 ft. (1919-1929)
9 Darcy Exploration T.D.-3,230 ft. (1919-1929)
10 Shell Oil Co. T.D.-1,030 ft.
11 Shell Oil Co. T.D.-8,329 ft.
12 Shell Oil Co. T.D.-3,414 ft.
13 Shell Oil Co. T.D.-5,343 ft.
(1948-1950)
14 Shell Oil Co. T.D.-2,472 ft.
15 Killarney Oil and Gas Ltd. (Drilling)
16 Imperial Oil Ltd. (Drilling)

AMPLE EVIDENCE of oil and gas in the Canadian Maritimes is the basis for the renewed exploration and leasing campaigns there. Fig. 1.



Canadian Report

Maritimes offer new challenge

. . . after 50 years of inattention by explorationists

BY WILLIAM S. SHAW

A VIGOROUS BURST of oil exploration has hit the Maritime provinces of Canada. Eleven operators hold leases or licenses to explore in an area covering about 18,000 sq. miles, roughly 75% of the total prospective land area. Three wildcats are drilling and at least seven field parties are conducting seismic, gravity, and geological studies. Just 1 year ago there was comparatively little land under lease or license and very little exploration work was in progress.

Interest is focused on sedimentary rocks of Mississippian age which underlie large parts of northern Nova Scotia, eastern New Brunswick and most of Prince Edward Island. There is abundant evidence of hydrocarbons in the form of a small oil and gas field, oil seeps, shows in wells, oil shales, and bituminous limestones. These provide assurance that hydrocarbons were generated in and have migrated through these rocks. The major problem now is to find reservoir rocks in a trap position.

This region has experienced several spurts of activity since 1859, when small flows of oil and gas were obtained from shallow wells in New Brunswick, but none of the plays in the past has been as extensive as the present one. For a hundred years the oil shales, seeps, bituminous sands and limestones, and solid hydrocarbons have tantalized oil men. In the early days they responded by drilling shallow wells near oil seeps and occasionally they were rewarded with small flows.

In 1909 commercial production of gas, with small quantities of oil, was discovered at Stoney Creek near Moncton, N. B. Since then, about 20 exploratory tests, ranging in depth from 1,000 to 14,700 ft., have failed to establish additional commercial production. During July of this year, three exploratory wells were being drilled and operators are optimistic.

Current Activity

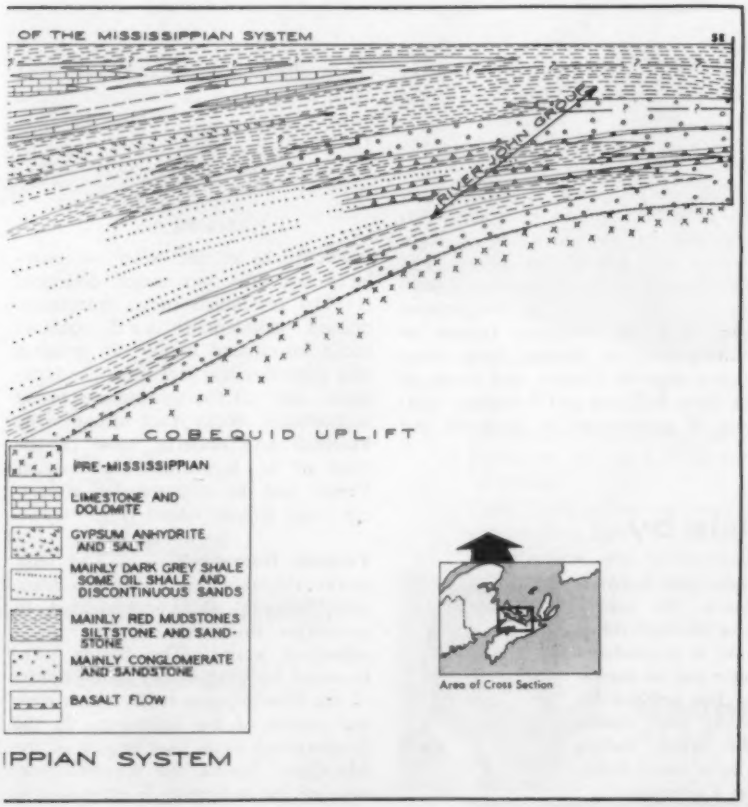
Eleven operators, including two major oil companies, five Canadian independents, and four American independents hold leases or licenses to explore in an area totaling about 18,000 sq. miles (Fig. 1).

New Brunswick Oilfields, Ltd., holds some 10,000 sq. miles in New Brunswick by virtue of a 99-year lease granted in 1907. Last year this company subleased about 1½ million acres (1a, 1b, 1c on Fig. 1) to Imperial Oil, Ltd.

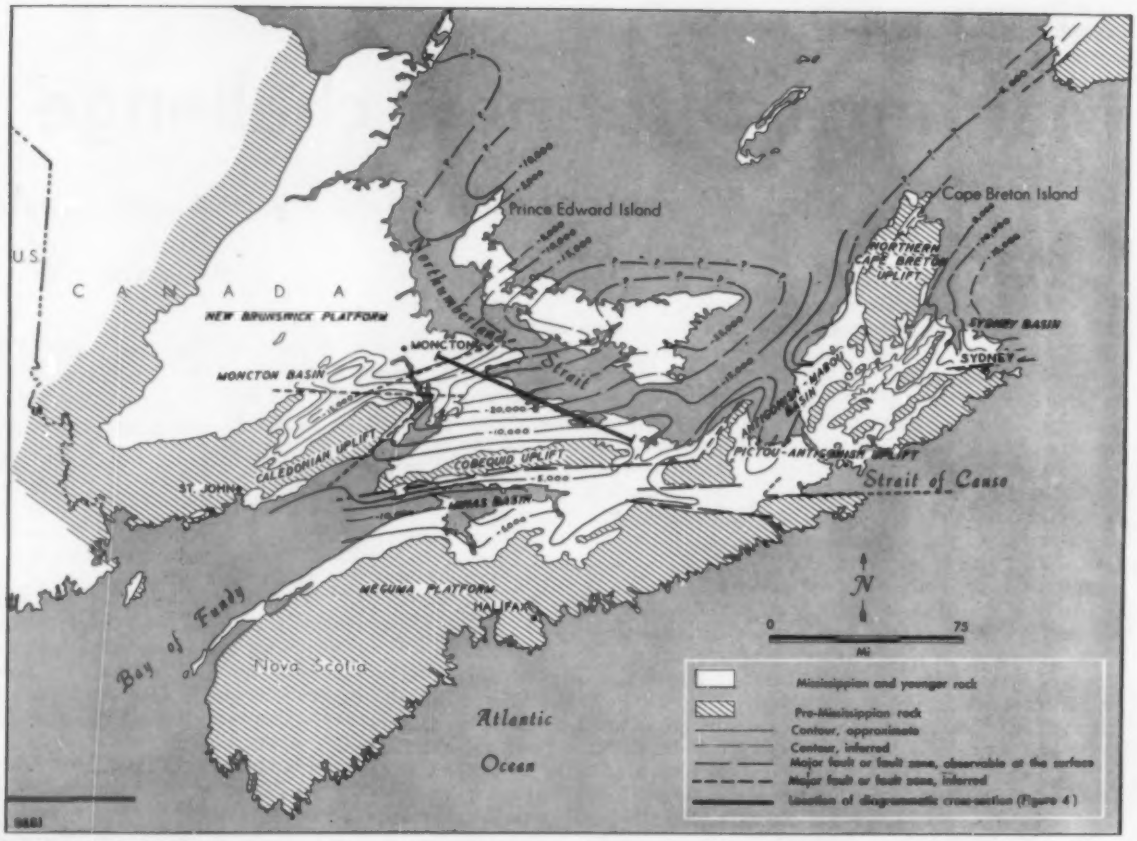
The remaining acres in New Brunswick, Prince Edward Island, and Nova Scotia are held by licenses to explore. Licenses, granted by the provincial governments, carry requirements for minimum exploratory expenditures which increase yearly.

Exploration . . . Three wildcats are drilling. Imperial Oil is drilling its second well this year on Prince Edward after abandoning its first wildcat at 9,417 ft. New Brunswick Oilfields is drilling an outpost south of Stoney Creek field, and Killarney Oil & Gas is drilling on the outskirts of Fredericton, N. B. (Fig. 1). A fourth wildcat test is expected to be spudded in the Antigonish area late this summer.

California - Standard and Eastern Northern Exploration are conducting seismic surveys on their holdings on Prince Edward Island and Nova Scotia respectively. Three American oil operators, Thomas Jordan, Inc., New Orleans; Billy Bridewell, Tyler, Tex.; and Raymond Hedge, Tyler, are conducting gravity surveys, air-photographic studies, and field geological studies on their concessions in northern Nova Scotia.



THIS diagrammatic cross-section reveals almost ideal conditions for the trapping of oil and gas in the Cumberland basin. Fig. 2.



GENERALIZED CONTOURS on top of the pre-Mississippian reveal numerous uplifts and basins that are potential oil and gas sources. Contour interval 5,000 ft. Fig. 3.

Economics

This activity in the Maritime springs from advantageous economic features as well as from favorable geological factors. The present crude-oil requirements of eastern Canada aggregate 300,000 bbl. per day. The rapidly expanding industrial economy of the St. Lawrence River region assures an increasingly large demand far into the future. Essentially all of the present requirements are satisfied by Latin America and the Middle East (Fig. 4). Western Canadian production cannot now compete in the market lying east of Toronto, and it is doubtful that it can reach a competitive position in the near future. The highly strategic market position of Maritime oil production is emphasized by the current Middle Eastern crisis.

The rate of industrial expansion in the Maritimes would be greatly accelerated by the discovery of substantial oil and gas reserves. The Maritimes have long awaited a supply of cheap energy to complement other favorable industrial factors including excellent harbors, large labor supply, equable climate, and access to the New England and European markets. If accelerated by local oil and gas production, Maritimes industrial expansion would, in turn, promote a broader local market for oil and gas. The only foreseeable limitation on production would be the maximum efficient withdrawal rates.

Geology

The rocks of the Maritime provinces fall into two major divisions: (1) The crystalline rocks, (metamorphosed sedimentary and volcanic rocks introduced mainly by granites and granodiorites) that form the highlands, and (2) the unmetamorphosed sedimentary rocks that occupy the lowlands and underlie most of the Gulf of St. Lawrence, the Bay of Fundy, and the offshore area of eastern Cape Breton Island (Fig. 3).

Tectonic framework . . . The sediments (Mississippian, Pennsylvanian, and Permian age) accumulated to enormous thickness in the rapidly subsiding basins. The basins were bounded by sporadically rising uplifts of pre-Mississippian rocks which were the source of the sediments. In the Cumberland basin, the largest of the Maritimes' basins, the present thickness of the sediments is estimated to

Here is an original article by . . .

WILLIAM S. SHAW, a geologist and geophysicist with Rodgers, Seglund, and Shaw Associates, New Orleans. His experience ranges from field work in the Yukon to oil exploration in the Caribbean and Gulf Coast areas. He is a graduate of St. Francis Xavier University in Nova Scotia and of Massachusetts Institute of Technology. Dr. Shaw has worked for the Geological Survey of Canada, conducting field studies in Nova Scotia, British Columbia, and the Yukon. Before joining his present firm, he was employed by a major American oil company as senior geologist in the Caribbean.

looking for oil

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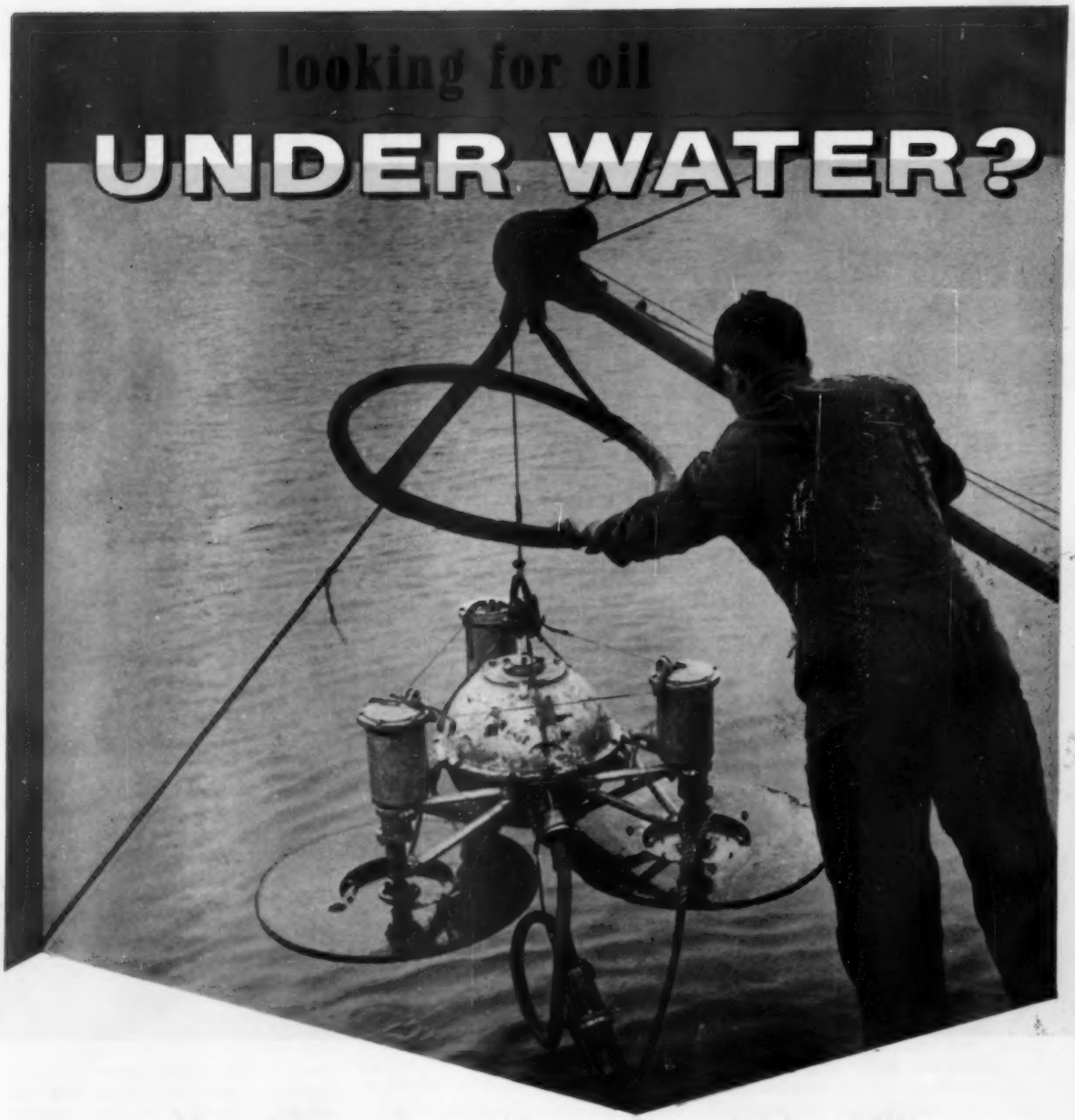

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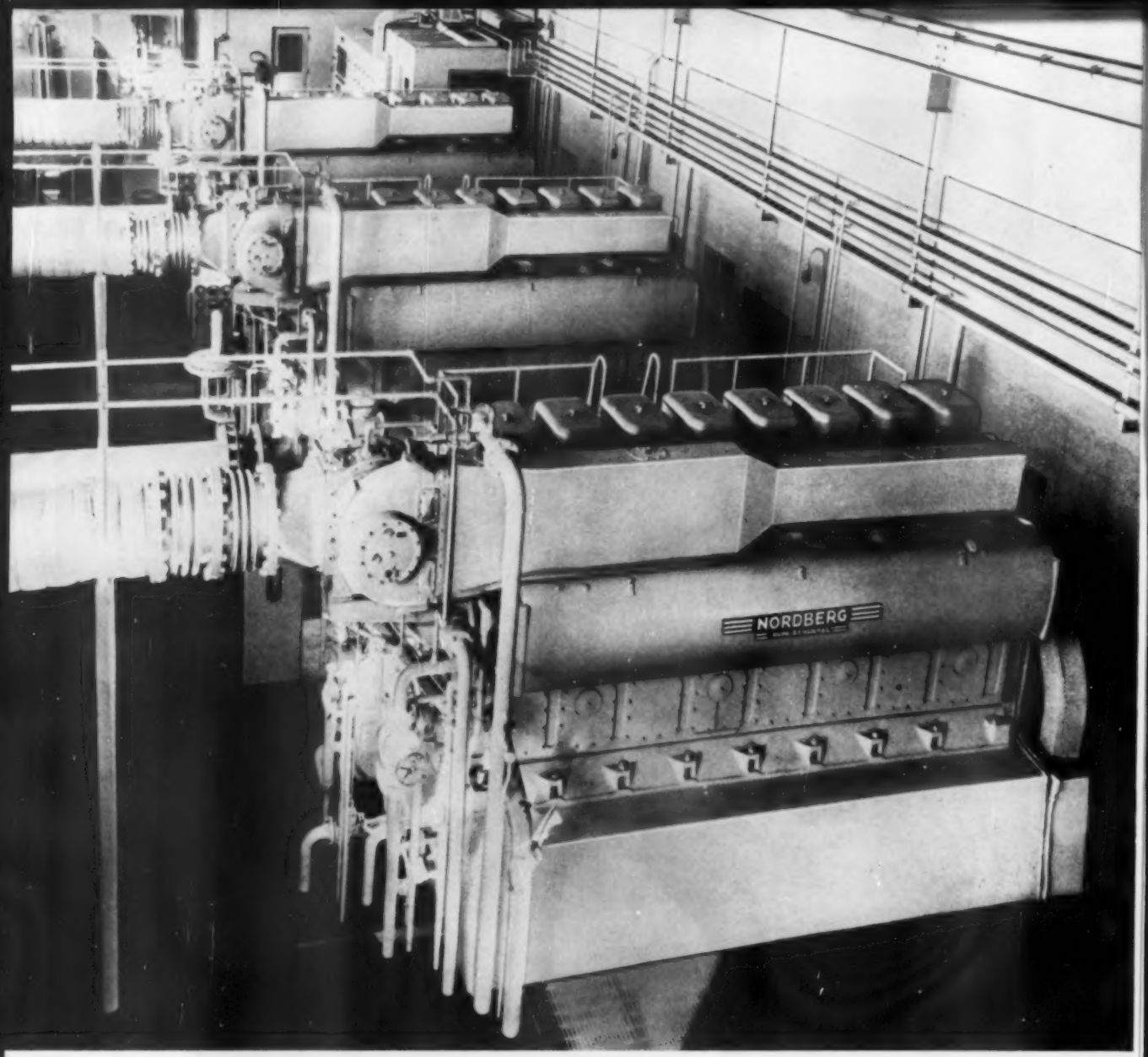

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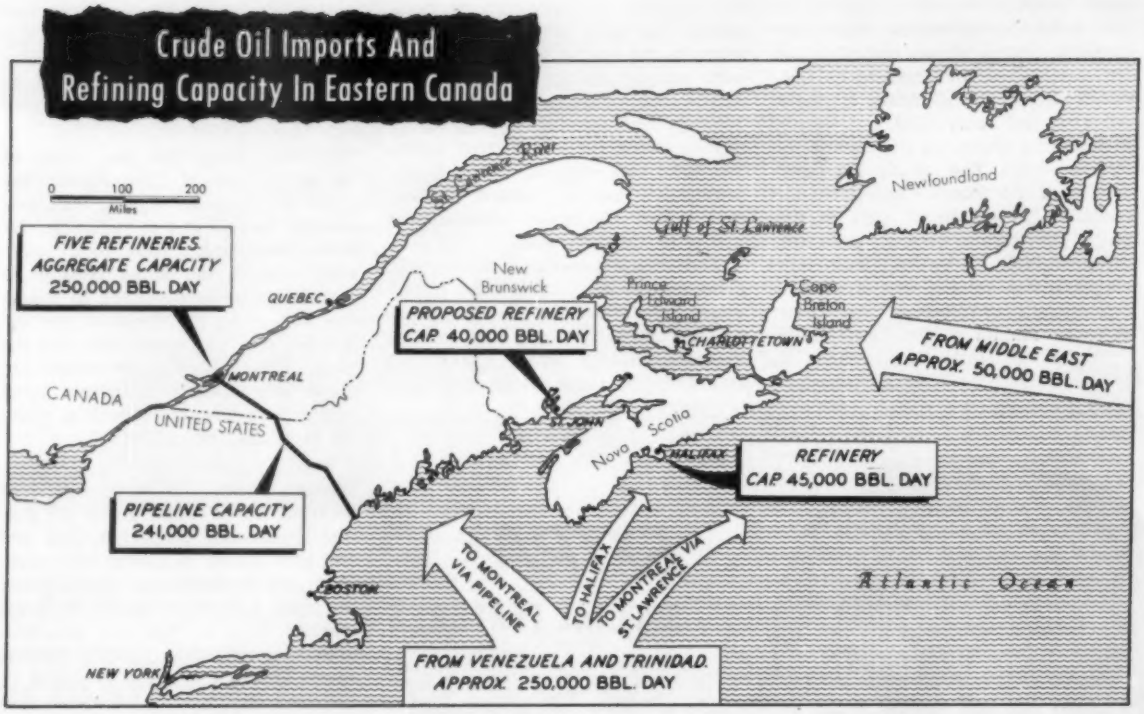

THE MARITIMES TODAY are dependent upon imported crude oil from Latin America and the Middle East. Large domestic production, if discovered, would have ready markets. Fig. 4.

be at least 25,000 ft. in the central part (Fig. 3).

The aggregate thickness of the original sections was somewhat greater. Toward the basin margins this thick prism of sediments thins and feathers out against the bordering uplifts. Somewhat smaller thicknesses of sediments occupy the other basins, but in all cases they thin and feather out against the bordering uplifts.

The present distribution of these rocks is considered to broadly define the original basins. Abundant evidence of overlaps, unconformities, and sedimentary facies changes indicates that configuration of the basins remained roughly the same throughout Mississippian and Pennsylvanian time, while the activity of the uplifts and relative position of the sea level varied. The basins and uplifts exhibit a striking geometrical relationship of east and northeast-trending elements which may have been determined by a shear system initiated during the Acadian (early middle Devonian) orogeny. Steeply dipping faults with large displacements are located at some of the margins of the uplifts and strike parallel to the long axes of the uplifts. These are shown on Fig. 3 together with faults that are inferred from the basin geometry.

Our knowledge of the gross forms of the basins is augmented by gravity data. The most striking features of the gravity map are the pronounced gravity maxima over the exposed crystalline rocks in contrast to the minima over the basin areas. Based on these gravity data, some magnetic and subsurface data, the present form of the basement has been conjectured (Fig. 3).

Stratigraphy . . . The sediments occupying the basin range in age from Mississippian through Pennsylvanian and possibly into the Permian period. Sandstone and volcanic flows of Triassic age are present in a long, narrow area along the southeast shore of the Bay of Fundy.

The Mississippian rocks are divided into three major groups which are recognizable throughout the Maritimes. They are from oldest to youngest: (1) The Horton group consisting chiefly of fluviatile and lacustrine sediments, and containing the only presently producing oil and gas reservoirs in the Maritimes; (2) the Windsor group, characterized by carbonates and evaporites, and containing the only definitely marine sediments in this region; and (3) the Canso group, composed of red and grey continental deposits.

The Pennsylvanian system consists of many thousands of feet of conglomerate, sandstone, shales, coal beds, and fresh-water limestones.

The Horton and Windsor groups offer abundant evidence of petroleum generation and are the prime petroleum-exploration objective in this region. The Canso group and the Pennsylvanian system do not offer evidence of oil and gas accumulation to the degree exhibited by the Horton and Windsor groups. Therefore they are not generally considered as possible objective rocks for oil and gas exploration.

The stratigraphy of the Horton and Windsor groups will be discussed further in an effort to point out the possible source rock-reservoir rock combinations upon which exploration is being focused. In Fig. 2, which is a diagrammatic stratigraphic cross-section of the Cumberland basin, the rock units have been recognized and mapped are shown in their probable time relationships. This cross-section contains considerable extrapolation of the measured and known facts. This is especially true in the central part of the basin where there is little direct information.

Horton group . . . The most characteristic rocks of this group are fine-gained, dark-colored, highly organic clastics which constitute a thick wedge generally enclosed by conglomerates, sandstone, and shale of the upper and lower parts of the Horton group. This relationship is illustrated in Fig. 2. The thickness of the entire group may

reach 10,000 ft. in central basin areas. This middle wedge includes dark grey to black organic shales, discontinuous grey sandstones, thin fresh-water limestones and locally abundant oil shale. Albertite and other solid and viscous hydrocarbon shows are common in the middle wedge. The oil and gas reservoirs of the Stoney Creek field are contained in the upper part of this unit. The highly organic sediments of the middle wedge and their associated hydrocarbons bear a striking resemblance to those of the Green River formation of the Uinta basin.

Within the Horton group there are two stratigraphic conditions which hold promise of petroleum accumulation. The dark grey, organic sediments of the middle wedge interfinger with coarser clastics in a generally narrow belt flanking the uplifts. The 2,000-ft.-thick productive interval of Stoney Creek field is located within this belt. This suggests that a highly prospective middle Horton fairway may border the major Mississippian uplifts in the Maritimes.

The second important stratigraphic condition for oil accumulation is suggested by the formerly live oil seeps in the upper Horton sandstones of the Lake Ainslie area, Cape Breton Island, N. S. These widespread grey, porous, and permeable sandstones and intercalated red beds belong to the upper coarse clastic part of the Horton group, which overlie and interfinger basinward with the wedge of organic sediments.

It seems likely that the source of the seepage oil at Lake Ainslie lies in the interfingered organic beds presumably located at a considerable distance basinward. Thus good reservoir rocks in the upper Horton do not appear to be restricted to a narrow belt along the flanks of the uplifts but may be present well into the basin. Upper Horton sandstones are prime objectives in structures lying within the basin area as well as along the flanks of the uplifts.

Windsor group . . . The characteristic rocks of the Windsor group are marine limestones, evaporites, and red and grey shales. A coarse red clastic facies, erratic in age, areal extent, and thickness is common along the basin margins. Fig. 2 illustrates, diagrammatically, Windsor facies relationships. The rich invertebrate fauna of the Windsor marine limestones has permitted a regionally applicable zonation of the group.

The presence of hydrocarbons in Windsor rocks is evidenced by the common occurrence of bituminous limestone, oil-filled vugs in gypsum and short-lived gas blows in two shallow core-holes. The world-wide association of petroleum accumulation with carbonate-evaporite facies should focus attention on the petroleum potential of the Windsor group.

Marine deposits as variable as those of the Windsor group offer so many possibilities for the development of porous and permeable rocks, that the entire area underlain by Windsor must be considered as prospective to some degree. Two particularly favorable stratigraphic conditions which are suggested by existing data are: (1) The zone of interfingering of marginal clastics with the carbonate-evaporite facies, and (2) primary porosity provided by oolitic and coquinoid carbonates. Abundant coral and algal remains suggest that bioherms may be present. Still other possibilities for Windsor reservoir rocks include secondary porosity developed by solution at unconformity surfaces and by fracturing during deformation.

Intra-basin structure . . . Within the basins there are three structural types which are of particular interest to petroleum exploration: (1) Broad, open folds which plunge from the margins of the uplifts into the basin, (2) tight, thrusted folds which are es-

EXTRA

SPECIAL FEATURES

The more distinctive and original the facial adornments of this New Guinea tribesman the more important he becomes in the eyes of his fellows. The character illustrated is wearing the Australian Government's Service Medal on his brow, and the cap badge of a shot down airman is his cowrie headband. Many other adornments from wrecked Allied and Japanese aircraft are worn to give distinction to the owner.

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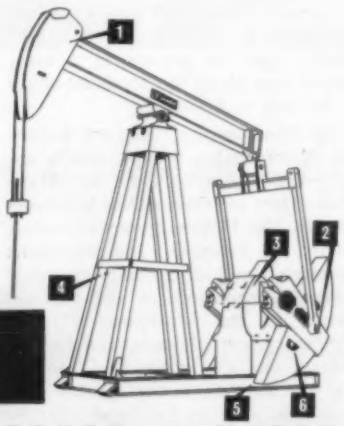

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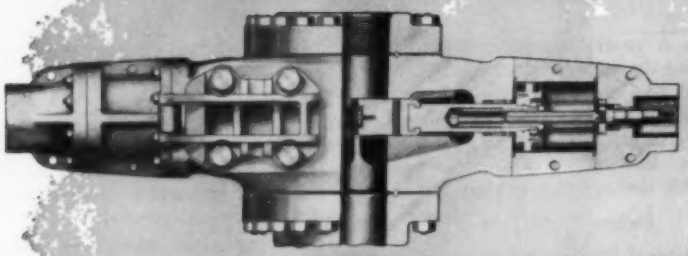

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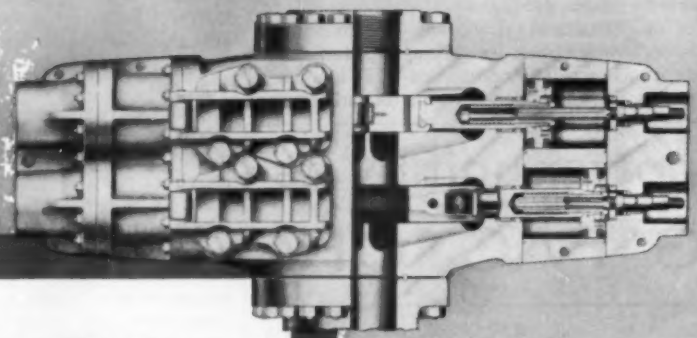

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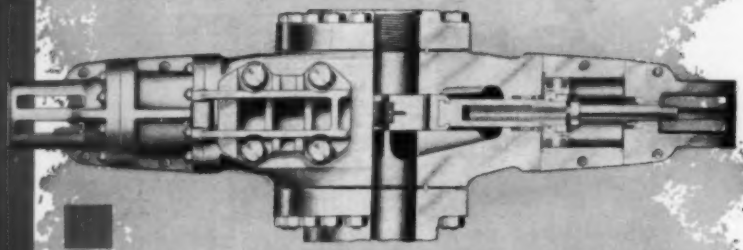

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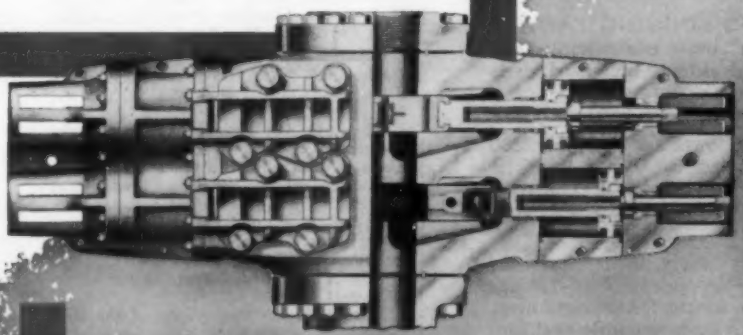

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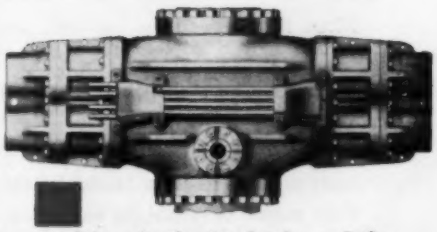

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pecially common in southeastern New Brunswick, and (3) salt anticlines, which are best developed in northern Nova Scotia and in western Cape Breton Island.

There is considerable evidence that deformation of the basins proceeded contemporaneously with the deposition of the Mississippian and Pennsylvanian sediments. Unconformities of various ages have been observed at the exposed truncated surfaces of some of the open plunging folds referred to previously. The intensity of folding of the Horton and Windsor groups is generally greater than that affecting the younger strata. This kind of evidence, supported by well-known evidence of large-scale intermittent activity of the major uplifts strongly implies that structural traps were available during Mississippian time.

Future Exploration

The Mississippian rocks of the Maritime provinces offer a variety of structural - stratigraphic combinations which may form reservoirs for petroleum. This, combined with abundant direct evidence of petroleum, makes the Maritimes' basins highly prospective.

The Horton and Windsor groups require further comprehensive regional stratigraphic studies of the kind conducted by Kelley, Murray, and Sage, to bring the favorable stratigraphic conditions into sharper focus.

In the immediate future it is probable that most of the exploration effort will be directed toward the salt anticlines and the broad plunging noses at the margins of the basins. The salt anticlines require detailed surface, gravity, and seismic surveys to predict reliably the structural conditions at depth. Some of these salt anticlines are well located with respect to favorable Horton and Windsor stratigraphy. The Horton group, undisturbed by the diapiric activity of the Windsor salt, may be found in comparatively simple folds. Salt-truncation traps in the upper Windsor are good possibilities.

The Maritime provinces are due for an intensive and sustained exploration effort. Here is a challenge worthy of the most competent, resourceful, and imaginative explorationists.

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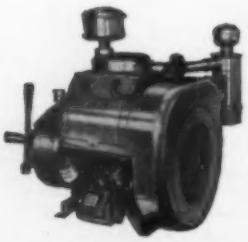

Model VR4D 56 hp

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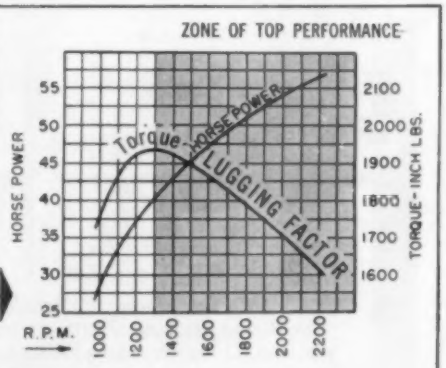
ENGINE power curve



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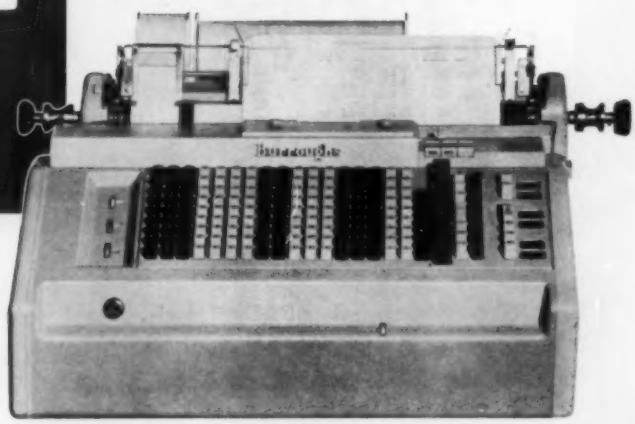

The largest electronic bank bookkeeping installation in the State of Oklahoma was contracted for June 19 by National Bank of Tulsa. This equipment, consisting of 8 Sensitronic Dual Printers and 1 Auto-Reader, was ordered for delivery this fall. These 9 automation units will replace 22 conventional posting machines.

If you have automation plans, you are invited to consult with NBT and take advantage of its many years of study and research in the field of electronic accounting. This knowledge is yours for the asking.

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More about Canada . . .

Here's news of an Alberta find

A FORT WORTH FIRM has given southeastern Alberta its first Devonian oil discovery in many years. Southland Royalty Co. recovered up to 800 ft. of clean oil on tests of the Jefferson at its 6-31 Bays wildcat on LSD 6, 31-11-13w4.

The last commercial oil production found in the Jefferson, or indeed in the Devonian, in this region was at Princess field, about 50 miles north of the Bays wildcat. That latter field was being developed previous to the famous Leduc discovery during wartime in 1944.

Another Jefferson discovery, however, along the same trend and considered to be much the same development, occurred in 1956. This was the Jefferson strike at Youngstown in 1956. The well was a small one, however. It is located 120 miles north of the Southland discovery.

The Devonian . . . The Devonian rocks in southeastern Alberta have never held much force with operators. There is no reason for this feeling except for the lack of discoveries in the Devonian strata. The new Southland discovery could change all this.

The Southland well reportedly has a 11-ft. pay section at the 4,100-ft. mark. The 800-ft. pipe recovery of oil was light oil. Production casing has been set to total depth of 4,345 ft.

. . . a P. E. I. well

THE second exploratory well by Imperial Oil, Ltd., in Prince Edward Island has been abandoned as a dry hole at a depth of 4,622 ft. Imperial Porthill No. 1, as the well was called, penetrated all formations which might have any prospects for oil or gas.

The rig is being moved to the MacDougall area where a third test will be drilled. It is expected the new well, Imperial MacDougall No. 1, will start drilling about mid-August. MacDougall is located between Porthill and Wellington, the site of the company's first exploratory well on the island.

. . . and a new map

A NEW Yukon-Northwest Territories lease and permit map has been announced by Nickle May Service, Ltd., of Calgary.

At a scale of 16 miles to 1 in., this sheet extends from the 60° parallel north latitude to the Beaufort Seat and from 125° west longitude to the Yukon-Alaska border.

The map covers the major portion of western Canada's latest major land play centering on the Mackenzie River delta in which some 49,155,877 acres have been either issued in permit form or applied for.

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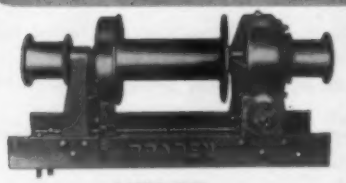

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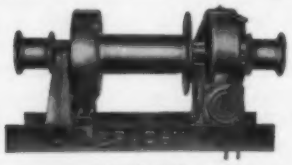

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Oil finders eying

Louisiana find is near salt dome

A deep wildcat located 2 miles south of production flanking the large Chacahoula salt dome is being completed as one of South Louisiana's best oil discoveries of recent months.

It is Humble Oil & Refining Co.'s 1-B Lutcher-Moore, in the northwest corner of Terrebonne Parish, near the Lafourche Parish line.

Completion is from two zones in Miocene sand. The upper, at 12,504-10 ft. produced 39.1°-gravity oil at the rate of 423 bbl. daily through ⅛-in. choke. Flow from the lower interval, at 12,664-74 ft., was 350 bbl. of 42.9°-gravity oil per day, also through ⅛-in. choke.

Gas-oil ratios were 1,111 cu. ft. per barrel from the upper zone, 2,891 cu. ft. per barrel from the lower. Flowing pressures were 4,700 psi. and 5,200 psi., respectively.

The two zones are in an exploratory hole drilled to 15,128 ft.

Location is almost on a line between Chacahoula production, in Lafourche Parish, and the deep Amelia field, less than 5 miles southwest, in the south corner of Assumption Parish. It also is only about 6 miles north of sprawling production in the Gibson area.

CHACAHOULA - Gibson-Amelia triangle area in southeastern Louisiana showing position of Humble Oil & Refining Co.'s prolific new oil discovery.

Northwestern Terrebonne Parish also was the scene of another discovery during the week. It was by Shoreline Drilling Co. and American Natural Gas Co. at their 1 Continental Land & Fur Co., about 2 miles east of North Turtle Bayou field, and about 8 miles southwest of Humble's new well.

Drilled to 12,305 ft., but productive from a zone at 12,230-43 ft., this discovery well flowed through ¼-in. choke at the rate of 3,650 M.c.f.d. of wet gas, recovering 36 bbl. of 47.9°-gravity condensate. Its pressure measured 5,500 psi.

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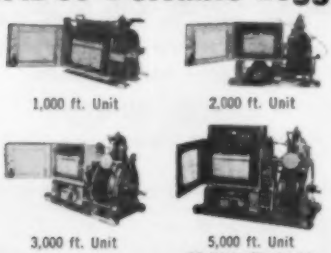

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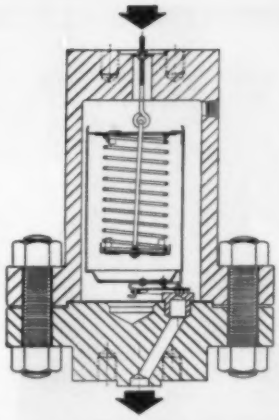
Bucket is first primed with water, the weight of which compresses spring and closes valve. As condensate enters at top, it spills over side of bucket and begins to fill body of trap. When level gets about half-way up bucket, buoyancy of bucket plus spring action overcomes pressure and lifts bucket, opening valve. As condensate discharges, bucket loses buoyancy and sinks, closing valve. Valve *always* closes before all condensate is discharged, thus assuring a perfect water seal at all times.



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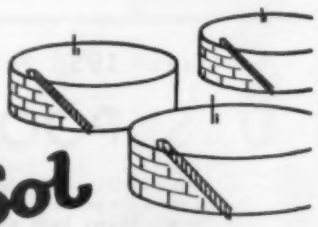

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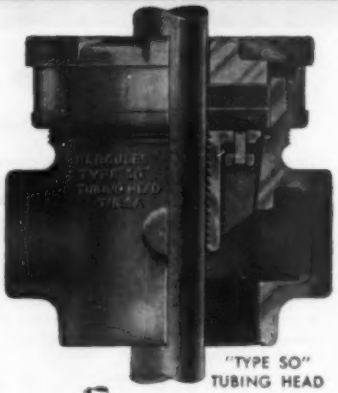

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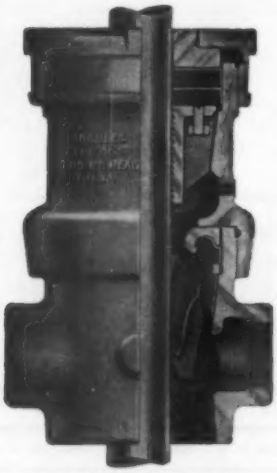

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$2.00 a copy

Reader Service Department

The Oil and Gas Journal

Box 1260 **Tulsa 1, Okla.**

Woodward field jumps to Major

ONE OF Woodward County's gas-distillate fields in northwestern Oklahoma moved across the county line into Major County.

Shell Oil Co. announced completion at 1-19 Culp, C SE NW 19-22n-16w, moving Cedardale field into Major County. The Mussellem-Pennsylvanian extension strike flowed on open flow test at the daily rate of 30 M.M.c.f. and 7.8 bbl. distillate and 5.9 bbl. water per million from perforations at 6,270-6,320 ft.

This field is northeast of the town of Cedardale and west Sherman on the east county line of Woodward and the west line of Major County. Northeast Cedardale was opened last year and has met with considerable success.

New Woodward test . . . A new wildcat is slated for Woodward County. Pan American Petroleum Corp. will drill 1 Ruttman in C SE NW 12-24n-21w, 9 miles due north of the city of Woodward.

Depth record for Eastern Kentucky

IN LESLIE COUNTY and located on Left Fork of Elkhorn Creek near town of Sizerock, United Fuel Gas Co. has reached total depth of 9,432 ft. at 28 Fordson Coal Co.

Test topped basement at 9,412 ft. No shows have been reported and operator is presumably shut down for orders.

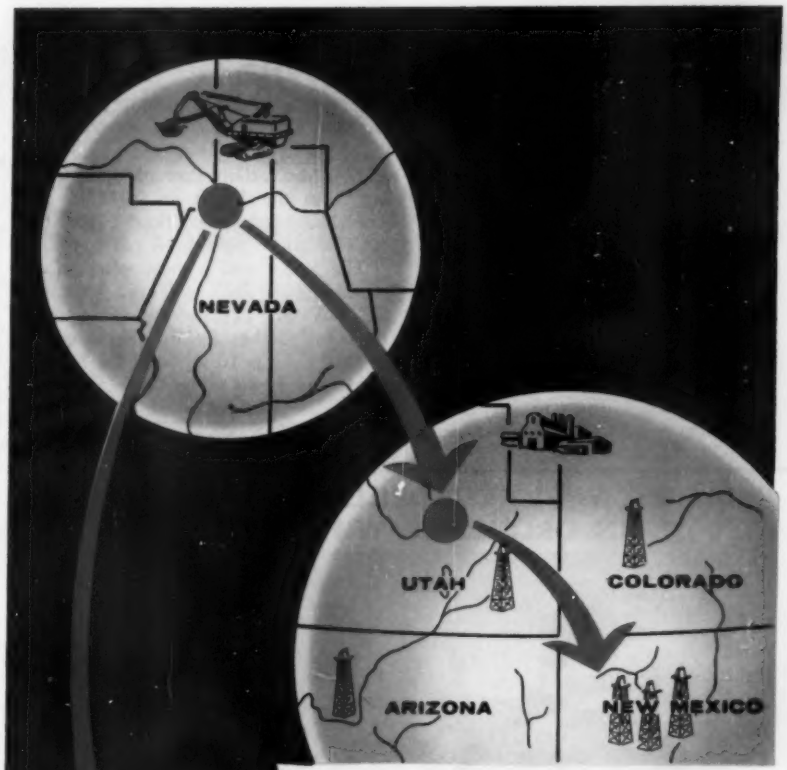
Drilling of this test establishes a new depth record for the entire state. Former record held was Shell Oil Co. with its 1 Davis in Crittenden County drilled to a depth of 8,821 ft. in 1956.

Two wildcats get Michigan attention

SEVEN NEW STARTS in Michigan included two interesting wildcat locations.

Sun Oil Co. will drill 1 Watson NW NW SE 30-19n-2w, Gladwin County, to approximately 5,300 ft. for test of Detroit River and Richfield zones.

E. Edwin Brehm is moving rig on 1 Tucker, NW NW NW 18-6s-1w, Hillsdale County, 15 miles southeast of the Scipio field. Brehm's wildcat is setup for a minimum of 4,200 ft. and will test Trenton, producing zone of the Scipio field.



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Wyoming spotlights gas finds

IMPORTANT gas confirmations featured Wyoming exploration news last week. Mountain Fuel Supply Co. tested 2 Trail Unit in NW SW 10-12n-100w, Sweetwater County, for 12,275 M.c.f. of gas daily from Mesaverde topped at 4,829 ft.

This Cretaceous well flowed open earlier at the rate of about 35 M.M.c.f. per day. The No. 2 Trail Unit is the confirmation to a 1952 discovery.

Elsewhere in Wyoming, the Lewis-Cretaceous gas discovery at Desert Springs in Sweetwater County, Green River basin, was completed. El Paso Natural Gas Co. 4 Desert Springs Unit, SW NE SE 35-21n-98w, flowed 15,600 M.c.f. daily through open tubing from the Lewis at 5,076-96 ft. The Mesaverde also flowed gas at rates up to 16,500 M.c.f. per day.

The No. 4 well is the confirmation to the Lewis discovery at 2 Unit in SE NW SE 22-21n-98w. That one flowed 12 M.M.c.f. daily. Production in this field is from both the Mesaverde and Lewis. The Lewis lies just above the Mesaverde in the Upper Cretaceous rocks.

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We feel that the self contained slip bowl in the Kelco Air Slips greatly minimizes damage to the drill pipe in the slip area.

Sincerely,

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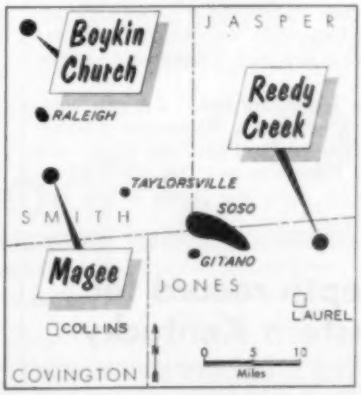
New Data Book on West Texas Published

Petroleum Review, a 1958 publication of drilling and production data on Reeves, Loving and Culberson counties, West Texas, has been announced by Phifer Petroleum Publications, P. O. Box 20,024, Houston, Tex.

The book is another in a series of county well data references. Illustrations include county and field maps, electric logs of discovery wells, and a geological chart for West Texas.

Data on fields give the discovery well, status of the field as of July 1, 1958, plus production, number of producing wells and cumulative production, by years.



SOUTH MISSISSIPPI'S three 1958 Lower Cretaceous new-field discoveries. Shown are other fields in area with Lower Cretaceous production.

South Mississippi gets new well

COMPLETION by Larco Drilling Co. last week of its Mooringsport discovery well, north of Laurel, in northern Jones County, opens southern Mississippi's third Lower Cretaceous field to be found this year. These fields are exclusive of new Lower Cretaceous reservoirs found productive in previously discovered fields.

Larco's discovery, named Reedy Creek field, follows within 2 weeks the opening of Arkansas Fuel Oil Co.'s Magee field, 25 miles northwest, in Smith County, with production from the Lower Cretaceous-Sligo zone.

Previously, in March, Larco and its associates opened Boykin Church field, 15 miles north of Magee field, in the same county, with production from the Lower Cretaceous-Rodessa sand.

The Mooringsport discovery well is completed on the pump making initially 77 bbl. of 28.3°-gravity oil per day, and is not indicated to be as

good as those at Magee and Boykin Church which were completed with good flowing production.

The Magee discovery well flowed better than 250 bbl. of 43°-gravity oil per day through ⅝-in. choke with a low ratio and good pressure. The Boykin Church discovery well flowed 216 bbl. of 38°-gravity oil per day through ⅛-in. choke, also with low gas-oil ratio and good pressure.

Pay in the Mooringsport well, drilled to 12,552 ft. in the Hosston zone, is perforated at 11,110-18 ft. It was acidized for completion. The Sligo well at Magee drilled to 14,021 ft., also into the Hosston, is perforated at 13,045-54 ft. At Boykin Church, the Rodessa pay is perforated at 10,-969-72 ft. The well also was drilled into the Hosston with bottom at 12,789 ft.

Larco's new discovery is southeast of the large Soso field, productive from the Lower Cretaceous Paluxy, Rodessa, Sligo (Bailey), and Hosston zones, and in addition from the deeper Cotton Valley formation, and the shallower Eutaw (Upper Cretaceous) sands. The Hosston and Cotton Valley pays are this year's discoveries.

Bijou gas field adds big oil well

THE DENVER BASIN'S apparent new giant, the Bijou area of Morgan County in northeastern Colorado, picked up a big oil well last week.

Bijou field, a gas producer, added its first oil well at Williamson, Kissinger, and T. C. Strain's 1 Schaefer, NW NW 8-4n-59w. The "D" sand Cretaceous discovery flowed 73 bbl. of oil per hour for 21 hours, or 1,752 bbl. per day. Perforations were at 6,108-08. ft.

This well is the first offset to the gas discovery well which was followed by big oil strikes at West Bijou and North Bijou. Production is from the "D" sand in all these areas. Prolific oil flows have been reported at field wells.

Ohio drillers hit Layland extension

A WEST EXTENSION to Layland pool in Monroe Township, Coshocton County, was announced by Ditch and Hanna.

Their 1 Fred Still, Section 4, logged Clinton and 3,364-90 ft. and 3,394-3,425 ft. with 2,650 M.c.f. gas and showing of oil natural and 10 M.M.c.f. and 50 bbl. in 24 hours after fracture.

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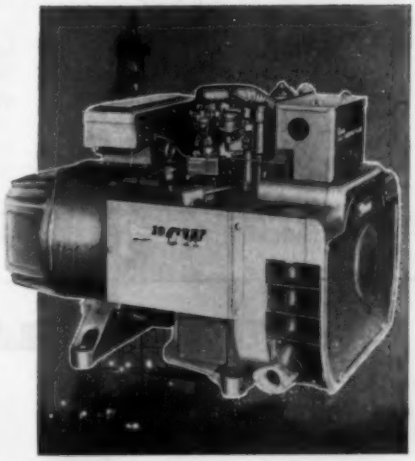

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It's a busy season for Texas drillers

THE LARGEST in a series of prolific gas wells completed during the past year in the Palacios-Collegeport area of southwestern Matagorda County, Texas Gulf Coast, is recorded by Kilroy Co. of Texas and F. A. Callery.

Their 1 L. A. Lovering, 4 miles northeast of Palacios, is rated good for 460 M.M.c.f. of wet gas per day, open-flow potential. Flow through ½-in. choke was at the rate of 4,645 M.c.f. with pressure of 3,274 psi. On 5/32-in. choke it was 1,914 M.c.f.d. with pressure of 3,390 psi. Liquid recovery was at the rate of 25 bbl. per 1 M.M.c.f.

Production is from a casing-perforated interval at 8,924-31 ft. in hole drilled to 8,987 ft.

The developing gas-condensate area extends around and across the upper portion of the Palacios Bay arm of Matagorda Bay, and now spreads over a radius of 4 to 5 miles. Development is in Frio sands ranging in depth from 8,100 to 9,100 ft. In addition to Kilroy and Callery, Tidewater Oil Co., Christi, Mitchell & Mitchell, and Brazos Oil & Gas Co. have been active in the area.

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JENSEN JACKS

Prospects good for third Bethel well

PROSPECTS of making a third Rodessa gas well in Bethel field, Anderson County, was reported by The Texas Co., who was moving in rig for a fourth try.

Texas Co.'s 1 E. C. Williams had total depth at 8,360 ft. Operators reported good gas shows in cores at 8,235-60 ft., and perforated at 8,232-80 ft. for testing. Location is in the Thomas H. Kingsley Survey, A-450, on the west flank of the salt dome.

The new well is 1 Cook Gas Unit, located on the 67-acre Sherwood Cook tract in Thomas H. Kingsley Survey. Projected depth is 9,800 ft., with a Trant Drilling Co. rig.

Texans move to far offshore waters

TEXAS' second offshore field to be discovered this year and the fartherest so far from shore was opened last week.

Its discovery well, drilled by Standard Oil Co. of Texas, is productive of gas and condensate from Miocene sand at 5,780-5,810 ft.

Location is 19 miles offshore from Jefferson County in Federal Tract 140-L of the outer Continental Shelf in High Island Area, 27 miles east of Galveston.

Gas flowed through chokes varying from 12/64-in. to 16/64-in. was at the rate of 2,000,000 cu. ft. per day. Gravity of liquid recovery was 53.8°. The well was drilled with Zapata Offshore Co.'s mobile drilling unit "Vinegarroon," operating in water 51 ft. deep.

Victoria dry hole converted to gas

AN OLD DEEP TEST in South Texas' Victoria County has been converted from a dry hole into a shallow sand gas well, good for 68 M.M.c.f.d.

Previous operators drilled the test, their 1 Mundt, to 9,513 ft. in 1953. Morgan Exploration Co., present

owner, cleaned out the hole, ran casing to 3,388 ft., and perforated the pipe at 2,842-48 ft. opposite a sand in which some gas showings had been logged.

Gas flow in production tests through ⅞-in. choke was under pressure of 1,229 psi. Gas is dry. Location is 5 miles northeast of Mission Valley, in the northwestern part of the county, near the DeWitt County line. It is more than 2 miles from nearest other production.

New Texas gas field gets second completion

Humble Oil & Refining Co. has completed a confirmation well and 1¼-mile south extension to the Butler field gas discovery in southeastern Freestone County.

The second well is Humble 1 Greer Brothers, 3 miles southwest of Butler in James M. Lyon Survey, A-19. Calculated potential was 14,500 M.c.f.d. of gas from perforations in the Woodbine at 5,142-47 ft. On actual flow test through ½-in. choke, the well made 6,905 M.c.f.d. Flowing pressure was 1,498 psi. Gravity of the condensate was 57°, with gas-liquid ratio of 392,000:1.

Tri-zone strike in Rio Grande

A NEW triple-zone well in the Shepherd area, south of Pharr, in southern Hidalgo County, Texas Rio Grande Valley, gives that field its first oil production and also an additional new gas-condensate reservoir.

The well is Harry L. Martin's 1 Joe McKinsey. It is the second triple completion discovered in October 1956 by Bettis & Shepherd, who now have three gas-condensate wells there.

First oil production found in Martin's well is from a Frio sand perforated at 7,230-38 ft. Flow through a P-41 choke was at the rate of 149.13 bbl. per day with gas-oil ratio of 810 cu. ft. per bbl., and pressure of 251 psi. Gravity of the oil was 43.4°.

The new gas sand is at 6,552-64 ft., from which the well is rated good for 9,700 M.c.f.d., open-flow potential. Gas yields 63°-gravity condensate at the rate of 7.19 bbl. per M.M.c.f. Shut-in pressure is 2,513 psi.

The third zone, perforated at 6,616-84 ft., adds another completion in the previously productive Mellinger sand. It has an open-flow potential of 38 M.M.c.f.d. of gas, recovering 9.33 bbl. of 58.6°-gravity condensate per 1 M.M.c.f. of gas. Shut-in pressure is 2,602 ft.

New Panhandle pool found in Hemphill

NEW Morrow-Pennsylvanian oil production was opened in northwestern Hemphill County in the Texas Panhandle. Unapache Oil Co. 1 G. B. Mathers was completed flowing 288 bbl. of oil per day from the upper Morrow at 9,499-9,902 ft. through 18/64-in. choke.

This new producing area is 12 miles northwest of the town of Canadian, Tex. It also lies 12 miles northeast of Parsell gas field, a Roberts County producer.

Gas pool found in Ohio's Wayne County

INDICATIONS of a new gas pool were found by Snyder-Wirt-Starn in a well on Roy Snyder, Section 21, Wayne Township, Wayne County, 2 miles north of the city of Wooster, Ohio.

Clinton sand at 3,418-3,432 ft. made a small showing natural but gaged 1,120 M.c.f. with 1,100 psi. pressure after fracture.

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THE OIL AND GAS JOURNAL

Californians look at Sacramento Valley

THE SEARCH for new gas reserves in Sacramento Valley this year promises to be the most extensive so far. As is usual, wet roads and flooded field kept activity down during the first half. But in early August a total of 14 wildcat and extension tests were under way.

This year's search also is noteworthy in another way. In the past, most of the work was done by major companies. This year it's the small operator who is doing the drilling. Independents were the operators on 10 of the 14 exploratory wells, some of which were on farmouts from large oil companies.

During the first 7 months, a total of 23 tests were drilled in the 10-county Sacramento Valley area. These resulted in a new field discovery, a new pool, two successful extensioners —and 19 dry holes. Reflecting the hazardous drilling, 17 dry field wells also were completed along with 17 gas producers.

Current activity . . . Of the various developments under way, one of the more promising is that of Porter Sesnon and Great Basins Petroleum Co. in the old Vernalis field, San Joaquin County. Acting as operator for Great Basins, which now holds over 21,000 acres in the area, Sesnon in June completed a 1½-mile northwest stepout to the field's only producer. The well was rated at 2,500 M.c.f.d. through perforations at 3,860-85 ft. Since mid-July it has been producing 500 M.c.f.d., for which the producer received 23 cents per 1,000 cu. ft.

Should developments prove such a program feasible, Great Basins plans to drill some 10 or 12 more wells at Vernalis before the end of the year. Sesnon was scheduled to start a second well about August 15. This test, in SE NW 22-3s-6e, is about ¾ mile west of the June completion.

. . . A deep test by Humble Oil & Refining Co. near Orland, Glenn County, has reached a depth below 12,500 ft. The wildcat is slated to go to 15,000 ft., making it the deepest test ever drilled in the northern part of the valley.

Humble, the only major company currently exploring in the valley, has another wildcat under way at Schohr Ranch in Butte County. The test, in 14-18n-1e, is about 1 mile northwest of the 2,580-ft. discovery it made last year. Humble was drilling another wildcat, 3 Elna B. Schohr, some 2¾ miles south of the discovery. Another Butte County wildcat for which Humble has staked location is 1 G. V. Roney et al., in 1-23n-1w.

. . . Other wildcats under way included G. E. Kadane & Sons' test at Kirby Hills and that of McCulloch Oil Exploration Co. near Vacaville, both in Solano County. In Tehama County, Hancock Oil Co. was starting a test at Rancho Barranca Colorado and Royalty Service Corp. was below 4,800 ft. at a wildcat near Corning. Contra Costa, San Joaquin, and Sutter counties each had one wildcat at work.

Pennsylvania well may go to granite

A POSSIBLE record-breaking wildcat is under way in Erie County, northwestern Pennsylvania. Benedum-Trees is drilling at 7,580 ft. at its 1 Kardosh. It may be taken to basement. If it does go to the bottom, it will be the first such test in western Pennsylvania.

. . . Lake Erie. The offshore well in Lake Erie, the New York State Natural Gas Co. 1 Department of Forests and Waters, is drilling at 2,655 ft. after setting pipe (⅝-in.) at 2,490 ft.

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Arizona tries for second oil well

ARIZONA will get its first field-development well. Humble Oil & Refining Co. will put down a field well at 1-E Navajo in SW NE 10-41n-28e, Apache County, 1 mile southeast of the state's only oil well and 2¼ miles southeast of Red Mesa Trading Post. The 6,000-ft. Paradox Pennsylvanian wildcat will be a stepout from East Boundary Butte field (an area of Paradox gas production and one oil well).

East Boundary Butte field was opened about 4 years ago. There is one oil well, two gas wells. The oil well produces from 10 ft. of section between 4,806-16 ft. Initial potential was 47 bbl. of oil daily and 4,141 M.c.f.d. of gas. The gas wells were Shell Oil Co. strikes.

There are five gas wells in Arizona. The three producing areas are East Boundary Butte, Bita Peak, and Toh-A-Tin, all in Apache County and all on the south rim of the Paradox basin.

Drilling starts in San Miguel County

DRILLING was under way last week at Miami Petroleum Co., Inc., 2 Hoover Ranch, the firm's second rank wildcat in the area northwest of Tucumcari, San Miguel County, New Mexico.

No. 2 Hoover Ranch is projected to 7,500 ft., or to the Precambrian granite. Location is SW SE 18-12n-29e, 11 miles northwest of Tucumcari and 2½ miles east of 1 Hoover Ranch, which was dry in granite at 6,848 ft.

Gas shows were reported in granite wash around 5,510 ft. in 1 Hoover Ranch, and unofficial reports said sample cuttings had oil shows. The first well was drilled near the crest of Johnson dome.

General Crude Oil Co. is participating in the current San Miguel County wildcat.

Hidalgo County wildcat logs gas show

Humble Oil & Refining Co. 1-BA State, exploratory test in NW NE 25-32s-16w, Hidalgo County of extreme southwestern New Mexico, had a small flow of gas.

On drill-stem test at 4,190-4,219 ft., gas surfaced in 32 minutes and flowed at the rate of 10,260 cu. ft. per day. Recovery after the test was gas-cut mud. Drilling continued below 5,267 ft. The formation tested was identified only as Permian age.

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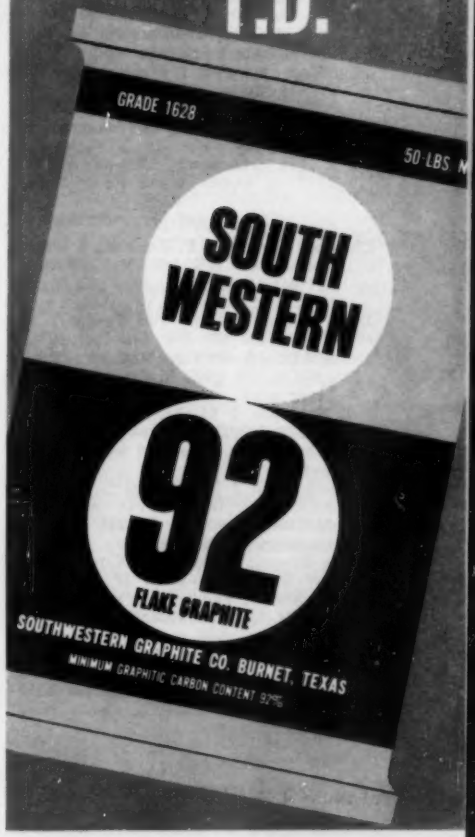

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Standard Oil Co. of California 1 Deep Creek Unit, Kenai Peninsula. Dry. TD 14,221 ft. Alaska's deepest hole.

COLORADO

Morgan County: Williamson-Kissinger 1 Chester Bender, C NE NE 14-4n-60w. IP 23 BOPD, "D" sand 6,193-97 ft., 6,198-99 ft. TD 6,320 ft.

Thames & Turnbull 1 State, C SW NW 5-4n-59w. IP 552 BOPD "D" sand 6,096-98 ft., 6,100-06 ft. TD 6,246 ft. Opens North Bijou field.

Sundance Minerals 1 Etchinson, C NE SW 35-5n-60w. IP 480 BOPD, 34°, "D" sand 6,138-46 ft. TD 6,189 ft.

Rio Blanco County: Frontier 3 Government, SW SW 30-2n-96w. IP 2,350 M.c.f.d. of gas, Mesaverde 5,736-48 ft. TD 7,555 ft. Opens White River Dome.

ILLINOIS

Christian County: H. F. Robinson 1 Robert Hobbs, NE NE NE 35-15n-2w. IP 224 BOPD, Silurian 1,892-1,902 ft. TD 1,902 ft. Extension to Mt. Auburn pool.

Jasper County: M. L. Van Fossan 1 M. Geiger, SE SE SW 6-5n-11e. IP 25 BOPD. 15 BWPD, McClosky 2,894-2,904 ft. TD 2,922 ft. Extension to Ste. Marie pool.

J. W. Rudy 1 Menke, NW¼ 6-5n-11e. IP 320 BOPD, McClosky 2,845-54 ft. TD 2,861 ft. Extension to Ste. Marie pool.

Frank Bolin 2 R. E. Watkins, NW SW SE 5-7n-9e. IP 8 BOPD, 20 BWPD, McClosky 2,902-12 ft. TD 2,945 ft. Extension to Gila field.

Saline County: Kewanee Oil Co. 1 Harris, SW SW SW 10-8s-6e. IP 40 BOPD, 60 BWPD, Paint Creek sand 2,739-44 ft. TD 3,188 ft. Extension to Raleigh pool.

Washington County: Robert H. Robben 1 Menafee, NW NW SW 36-3s-5w. IP 358 BWPD, 48 BOPD, Silurian 2,288-2,365 ft. TD 2,411 ft. Opens North Coulterville pool.

INDIANA

Clay County: K. Kuhn 1 Resore, NE SE SW 8-11n-7w. IP 180 BOPD, 9 BWPD, 46°, Devonian 1,535-40 ft., 1,544-56 ft. TD 1,560 ft. Opens Cory pool.

Gibson County: Mutual Oil and A. Fritz 1 W. A. Schlamp, NE SW NE 5-2s-9w. IP 300 BOPD, Benoist 1,564-82 ft. TD 1,590 ft. Extension to Francisco pool.

Spencer County: Lohmann-Johnson 1 Chris 1 Tremper, SW SE SW 5-7s-5w. IP 13 BOPD, Paint Creek sand 1,048-51 ft. TD 1,065 ft. 38 BWPD. Opens South Grandview pool.

Posey County: Lohmann & Johnson 1 A. Aldrich, SW SE SE 34-5s-14w. IP 120 BOPD, Tar Springs 2,313-26 ft. TD 2,330 ft. Extension to North Wisborn pool.

KENTUCKY

Daviess County: Fred W. Row 1 R. B. Moorman, 6-N-29. IP 110 BOPD, O'Hara 1,793-99 ft. TD 1,799 ft. New pay discovery.

Muhlenberg County: Hanley & Bird 1 J. C. Moore, 15-H-29. IP 1½ BOPD, McClosky 1,595-1,614 ft. TD 1,721 ft. Opens South Pleasant Hills pool.

Webster County: Slagter Producing Co. 1 Arthur Rakestraw, 15-M-24. IP 32 BOPD, Cypress 2,543-54 ft. TD 2,938 ft.

NORTH LOUISIANA

Concordia Parish: Gernany & Gulmon 1 E. B. Wade "A," C E½ SE NE 19-7n-7e. IP 126 BOPD, 42°, Wilcox 4,911-14 ft. TD 4,998 ft. Opens Canley Lake field.

Jett Drilling Co. 1 State of Louisiana, Acc.-7n-10e. IP 58 BOPD, 45°, Wilcox 6,791-95 ft. TD 7,080 ft. Opens North Carthage Point field.

MONTANA

Teton County: Northern Natural Gas Co. 1 Blackleaf-Federal "A," 13-26n-9w. IP 6,300 M.c.f. of gas per day, second Madison 3,794-3,806 ft., 3,816-30 ft. TD 6,323 ft. Shut in gas discovery. First production in Disturbed Belt.

NEBRASKA

Banner County: Lewis & Stuarco 1 Johnson, C NE NW 30-18n-56w. IP 175 BOPD, "J" sand 6,725-40 ft. TD 6,800 ft. Opens Lewis field.

Kimball County: Bradon Drilling Co. 1 Petsch, C NE NW 20-12n-56w. IP 293 BOPD, "J" sand 6,522-28 ft. TD 6,644 ft. Opens Petsch pool.

Reserve Petroleum 1 Haack, C SW SW 34-13n-54w. IP 120 BOPD, "J" sand 6,099½-6,103½ ft. 6,104½-09½ ft. TD 6,180 ft. Opens Haack field.

Wyoming Western 1 Benziger, C NW NE 1-14n-58w. IP 240 BOPD, 38°. TD 6,836 ft. "J" sand 6,803-13 ft. Opens Benziger field.

Chandler & Simpson 1 Rodman "G," C SE SW 24-15n-55w. IP 235 BOPD, "J" sand 5,917½-24 ft., 5,926-27 ft. TD 6,010 ft. Opens Simpson pool.

British-American 1 Bowman, C SE SW 35-16n-55w. IP 140 BOPD, "J" sand 6,112-17 ft. TD 6,180 ft. Opens Bowman field.

NORTH DAKOTA

McKenzie County: Amerada-Texas 1 C. C. Mogen Tract 1, SW SE 10-153n-96w. IP 85 BOPD, 44 BWPD, 44.3°, Duperow-Devonian 10,570-88 ft., 10,599-10,672 ft. TD 11,887 ft. Opens West Charlson field.

TEXAS GULF COAST

Colorado County: The Texas Co. 1 Matthews Gas Unit 1, Thomas Cartwright Sur., A-11 (3 miles southeast of Garwood). Absolute open-flow potential 2,230 M.c.f. daily, dry gas, shut-in TP 997 psi., perforations 2,235-43 ft. (New field discovery—1¾ miles southeast of South Garwood field.)

Goliad County: Southwestern Oil & Refining Co. 1-A McGlothing, Maria de Jesus Y'Barvo Grant, A-51 (9 miles northwest of Goliad). IP 206 BOPD, 9/64-in., 43°, GOR 2,908 cu. ft. per bbl., TP 1,920 psi., perforations 8,422-30 ft. (Reklaw). TD 8,437 ft. (New pay in Riverdale field.)

Hardin County: J. P. Owen 1-F Doty-Jackson, Block 47, W. N. Cox Sur., A-13 (11 miles north of Silsbee). Flowed 66 BO on 10-hour test, 7/64-in., 39.4°, GOR 600 cu. ft. per bbl., TP 975 psi., perforations 6,591-95 ft. TD 7,763 ft. (New field—3¾ miles east of Jackson-Doty field.)

Kenedy County: Arkansas Fuel Oil Corp. 1 McGill, Section 54, C & M Sur., A-85 (5 miles southwest of Sarita). Absolue open-flow potential 1,050 M.c.f. daily, GIR 84.5 M.c.f. per bbl., 50.6°, shut-in TP 6,467 psi., perforations 10,-660-66 ft., 10,669-74 ft., and 10,688-10,700 ft. TD 11,628 ft. (New field discovery.)

Matagorda County: Kirkwood & Morgan 1 Pierce Estate, Robert Beggs Sur., A-117 (4 miles north of Bay City). IP 144.14 BOPD, 7/16-in., 31°, GOR 1,326 cu. ft. per bbl., TP 1,000 psi., perforations 6,316-19 ft. TD 6,325 ft. (New field discovery—Bay Prairie.)

Russell Maguire 1-B Huebner, James Slivey Sur., A-382 (4½ miles southeast of Bay City). IP 389.22 BOPD, 15/64-in., 42°, GOR 769 cu. ft. per bbl., TP 750 psi., perforations 9,506-14 ft. (Frio). TD 9,600 ft. (New pay in Faith-Mag field.)

Victoria County: Dudley T. Dougherty and Morgan Exploration Co. 1 Spiegelhauer, John Cahill Sur., A-150 (2 miles southeast of Victoria). Absolute open-flow potential 1,480 M.c.f. daily, dry gas, shut-in TP 955 psi., perforations 2,354-57 ft. (Oakville-Catahoula). TD 3,001 ft. (New pay in Patricia field.)

SOUTHWEST TEXAS

Atascosa County: Sun Oil Co. 1 Peeler, Section 175, Dr. Charles F. Simmons Subd. 2 (13 miles southeast of Jourdanton). IPP 56.67 BOPD (net), 4.65% water, 43.2°, perforations 4,161-63 ft. (Wilcox). TD 5,530 ft. (New field discovery.)

Duval County: Farenthold & Pitcairn 1 Canales Share 28, J. M. Hinojosa Grant, A-628 (6 miles south of Realitos). Absolute open-flow potential 3,200 M.c.f. daily, GLR 62.6 M.c.f. per bbl. 64.5°, shut-in TP 1,851 psi., perforations 5,084-88 ft. (Pettus). TD 5,300 ft. (New field discovery—Balderas.)

Hidalgo County: V. F. Neuhaus 1 Lula Mead Unit, Tract 193, Section 160, West Tract Subd., Llano Grande Grant 2½ miles north of Weslaco). Absolute open-flow potential 15 M.M.c.f. daily, GLR 25,990 cu. ft. per bbl., 51.3°, shut-in TP 5,608 psi., perforations 9,540-50 ft. TD 9,630 ft. (New pay in North Weslaco field.)

Moody Properties, W. E. Bakke, and Forest Oil Corp. 1 Ripley, La Blanca Grant (8 miles south of Donna). Absolute open-flow potential 3,600 M.c.f. daily, GLR 656 M.c.f. per bbl., 56.8°, shut-in pressure 2,235 psi., perforations 5,882-90 ft. (Frio), 31 M.M.c.f. daily, GLR 323 M.c.f. per bbl., 55.8°, shut-in pressure 2,504 psi., perforations 5,994-6,029 ft. (Frio), and 880 M.c.f. daily, GLR 292 M.c.f. per bbl., 52.7°, shut-in. pressure 2,365 psi., perforations 6,043-51 ft. (Frio). TD 8,097 ft. (New field discovery—Santa Rita.)

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D. C. Pursuant to the provisions of Public Land Order 1621 dated April 19, 1958, notice is hereby given that approximately 16,000 acres of land situated on the Gubik gas field, Alaska, lying north of the Brooks Mountain Range are being offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 1:00 P. M., E.D.T., on September 3, 1958. This acreage will be offered in separate parcels of designated leasing blocks not exceeding 640 acres as shown on the leasing map of the Gubik gas field. This map of the Gubik gas field, as well as maps of the surrounding lands which are subject to noncompetitive leasing, is contained in a map portfolio which will be available for examination or purchase at $1.50 per portfolio at the Land Offices, Anchorage and Fairbanks, Alaska, and at the Bureau of Land Management, Interior Building, Washington 25, D. C. Details of the lease offer, how and where to submit bids may be obtained from either of the offices named. (Edward Woozley, Director, Bureau of Land Management, Washington 25, D. C.)

ROLAND V. RODMAN, whose statistics show that . . .

Small Operators Can Succeed

IS THE INDEPENDENT oil man doomed to be gobbled up by his major-company competitors? Does he stand a chance in the rough and tumble days ahead?

Take it from Roland V. Rodman, the independent is still very much in the game. The capable operator has a good future.

Rodman is an outspoken advocate of the independent oil man—whether producer or refiner. As president of Anderson-Prichard Oil Corp., an integrated independent Oklahoma City company, he is in a position to know.

And Rodman bases his confidence in the outlook for independents on one all-important fact: Costs.

The independent who knows his business, according to Rodman, can produce, gather, and refine his crude cheaper than his major- company competitor.

Figures talk . . . Over the years Rodman has gathered an accurate set of comparative statistics to prove his point.

He says that in the same field the total lifting costs of the independent operators often will be considerably below those of the major. His gathering costs also will be several cents a barrel less than those of the major.

If the independent also is a refiner, he carries over his lower crude costs to offset advantages the major may pick up from high-volume production of larger plants.

Rodman thinks the independent's cost advantage stems from these factors: He can run a tighter company, control costs more quickly at the operating level, operate with fewer men in the field, and can run his affairs with a much lower management overhead.

As long as these economic conditions prevail, Rodman says he doesn't see how the independent oil man can be eliminated from the picture.

Rodman cites another example to prove his point. In the last 10 years while major companies have increased their refining capacity at a terrific rate over the independent, they have managed to gain only 2% more of the gasoline market. That's a remarkable tribute to the staying power of the small operator.

Unusual man . . . Rodman himself illustrates the capable management talent scattered through ranks of the independent oil operators.

This lawyer-oil man through the years has been a keen student of the industry. He's an avid collector of statistics; and just as important, he knows how to interpret them.

His knowledge of the industry sweeps into every branch, drilling, producing, pipelining, refining, and marketing. And it's a good bet any move made by Anderson-Prichard in any of these fields has been thoroughly analyzed by the company boss.

Rodman is thoroughly sold on cost control. He has a constant assortment of cost studies going within his company. His goal is to find, produce, and refine oil as cheaply as possible in spite of a constantly rising cost trend.

First a lawyer . . . Rodman got his start in oil as an attorney.

He received his law degree from the University of Nebraska in 1919 and engaged in private law practice until 1937. His first oil job was with Bay Petroleum Corp. in Denver.

By 1939 he had become vice president and general manager of Bay. In 1945 he was named president of Chalmeite Petroleum Corp., then a Bay subsidiary, and the next year was elevated to the Bay presidency. Rodman resigned this job in 1947 to head Anderson-Prichard.

Rodman has gained stature throughout the industry as a keen analyst of the oil business and an outspoken advocate of the independents' position.

Secretary of Interior Oscar Chapman named him a member of the National Petroleum Council for 1950. Rodman served as president of the Western Petroleum Refiners Association in 1954. He also is a director of the American Petroleum Institute and has served as a director of the Independent Petroleum Association of America.

Rodman has been a frequent witness before legislative and congressional committees considering measures affecting the oil industry. On nearly every such occasion his astounding fund of knowledge and deft use of statistics have prompted observers to comment: There's a man who knows what he's talking about.

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Personals

David R. Williams, Jr., a director of Williams Brothers Co. and vice president of Dutton-Williams Brothers, Ltd., has been named a director of Canadian Hydrocarbons, Ltd.

Jim S. Eads, senior secondary recovery engineer for Superior Oil Co. in Evansville, Ind., has been promoted to general superintendent in Crossville, Ill.

James W. Law has been appointed manager of Superior Oil Co. of Venezuela, with headquarters at Maracaibo. He succeeds **Howard Franques,** who has been named general manager for the company's drilling and production in the United States.

Paul Kayser, chairman and chief executive officer of Pacific Northwest Pipeline Corp., has also been elected president. He succeeds **Stuart F. Silloway,** who will resign September 1 to become president of Harriman Ripley & Co., investment bankers.

Personals

CALLEYA

Georges Calleya, former general manager of Mexican American Independent Co. and a vice president of Mexofina, is the new Latin American representative for Petrofina, the Belgian oil company. Calleya's headquarters will be in Mexico City **Hubert J. Skala,** former general superintendent for Mexican American Independent, will act as his assistant.

Sam W. L. Backus, purchasing agent for Barnwell Drilling Co., Inc., has been been named vice president and secretary of the company.

Norman G. Kittrell, district petroleum engineer for The Texas Co. in El Campo, Tex., has been promoted to assistant division petroleum engineer in Denver.

Sam A. Billington, production engineer with Pan American Petroleum Corp. in Ulysses, Kans., has been promoted to drilling research engineer in Oklahoma City.

Ralph E. Mullin, president of Westpan Hydrocarbon Co., Corpus Christi, Tex., has been elected a director of Colorado Interstate Gas Co. Mullin is also president and a director of Lotus Oil Co. and Trojan Oil & Gas Co. He is vice president and a director of A. R. Jones Oil & Operating Co.

J. C. Wiant, district superintendent at Ballinger, Tex., for Lone Star Gas Co., has been transferred to Joshua, Tex. He succeeds the late George Minton. **Boyd LaQuey,** formerly in Olney, Tex., has moved to Ballinger to replace Wiant. **R. A. Slaton,** pipeline construction superintendent, becomes senior foreman in Olney.

Wallace R. Bartron, formerly of Bartron & Arndt, has joined Project Management Corp., Los Altos, Calif., as vice president and director in charge of engineering production in the San Francisco office. Project Management had prime contracts for expansion of American Independent Oil Co.'s Kuwait-Saudi Arabia Neutral Zone facilities. The company is affiliated with Carroll E. Bradberry & Associates, Los Altos consulting engineers.

Hurley D. Pepper, petroleum engineer in Cuyama, Calif., for Richfield Oil Corp., has been promoted to district production engineer at Long Beach, Calif.

T. S. Melby, formerly petroleum engineer with Shell Oil Co., has joined Reserve Oil & Gas Co. as petroleum engineer in the Tejon field, near Bakersfield, Calif.

Gordon L. Romine, formerly with Monsanto Chemical Co.'s Lion Oil division, has joined Keplinger & Wanenmacher, Tulsa consulting firm. Romine had been with Lion Oil since 1954.

Dr. Philip C. White, manager of the research department of Standard Oil Co. (Ind.), has been appointed general manager of the new research and development department. Research and patent activities of the company have been consolidated to form the department.

Charles C. Hoffman, chief geologist for Cities Service Gas Co., and **J. W. (Bill) Flint,** superintendent of communications, have retired. Hoffman has been with the company since 1917. He was supervisor of the Central Texas land and geological departments before becoming chief geologist in 1930. Flint joined Cities Service in 1919. He was assistant superintendent of the telephone and telegraph department before being promoted to superintendent in 1951.

Lewis G. Weeks, who recently retired as chief geologist of Standard Oil Co. (N. J.), has opened consulting offices in Westport, Conn. Weeks was named chief geologist of Jersey Standard in 1954. Before that time he was staff and chief research geologist for Jersey in New York and had served in several South American countries. He was president of Standard Oil Co. of Bolivia and chief geologist of Standard Oil Co. of Argentina at one time.

John J. Rowan, assistant manager of the Montreal East refinery of Imperial Oil, Ltd., since 1953, has moved up to manager. He succeeds **Dr. J. L. Huggett,** who has retired. Rowan joined Imperial in 1936. Huggett, retiring manager, joined Imperial in 1914. During World War II he was manager of St. Clair Processing Corp., a company formed to operate parts of the government-owned Polymer Corp. at Sarnia. He was manager of Imperial's Sarnia refinery before taking over at Montreal East.

A. H. Crookston has joined Continental Oil Co. as engineer trainee in Linch, Wyo.

Wilbur S. Johnson, tool pusher with Falcon Seaboard Drilling Co., has been transferred to Fort Morgan, Colo., from Guymon, Okla.

Herbert A. Klemme, assistant petroleum engineer with General Petroleum Corp., has been transferred to Santa Fe Springs, Calif., from Taft, Calif. The transfer will be a change from development to secondary-recovery work.

Ray O. Shaffer, president of Welex, Inc., Fort Worth, has been elected chairman of the board of Reed Roller Bit Co., Houston. **John F. Maher,** formerly president of Oil Center Tool Co., Houston, has been elected president and a director of Reed Roller Bit. Shaffer succeeds **S. P. Farish,** who

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will continue as a director. Maher replaces **Rex G. Hamaker,** who has retired. Hamaker will continue as a consultant to the company. Also elected a director of Reed Roller Bit is **A. H. Rowan,** chairman of Rowan Drilling Co., Fort Worth.

Dr. Bernard S. Friedman, research associate with Sinclair Research Laboratories, Inc., Harvey, Ill., has been named recipient of the 1958 Honor Scroll Award of the Chicago chapter of American Institute of Chemists.

J. C. (Jimmy) Johnston, manager of Continental Oil Co.'s Rocky Mountain production operations since 1938, will retire August 29. Johnston will join his son, **W. R. (Bill) Johnston,** in the management of Aspen Drilling Co., Denver. His daughter, **Mary,** a Denver oil and gas attorney, is secretary of Aspen Drilling. Active in the API production division, Johnston has been chairman of both the Rocky Mountain and Mid-Continent districts. He has also served on government advisory boards including the Petroleum Administration for War and the Petroleum Administration for Defense. He is currently on the Military Petroleum Advisory Board.

Personals

JOYNT

Kenneth R. Joynt has moved up from assistant superintendent to superintendent of Magnolia Petroleum Co.'s Gulf Coast producing division. He succeeds **J. B. Goodrich,** who will retire September 1. **John S. Russell,** formerly in Oklahoma City, will move to Houston to succeed Joynt as assistant superintendent. Joynt joined Magnolia in 1946. He was assistant superintendent of the Louisiana-Gulf division before being transferred to Houston in February.

D. B. McNeely, Jr., mechanical engineer in Houston for Shell Oil Co., has been named gas engineer.

Robert D. Ferguson, regulatory engineer with United States Geological Survey in Casper, Wyo., has retired.

E. E. Tisdale, district geologist in Wichita Falls, Tex., for Cities Service Oil Co., has been transferred to Billings, Mont.

J. R. Randolph, area seismologist, has been named senior geophysicist by Shell Oil Co. He will headquarter in Houston.

James S. Miner, junior engineer with Seaboard Oil Co. in Corpus Christi, Tex., has been named assistant field engineer in Conroe, Tex., for The Texas Co. The change is a result of the recent Seaboard-Texaco merger.

G. W. Atchley, Republic Natural Gas Co.'s district superintendent in Hugoton, Kans., has been promoted to assistant general superintendent in Dallas. **C. P. Pyeatte** moves up from assistant district superintendent to superintendent in Hugoton, succeeding Atchley. **W. F. Griffith, Jr.,** has been transferred from Pauls Valley, Okla., to Hugoton to become assistant district superintendent there.

Four new district marketing offices have been opened by American Petrofina. **R. B. Sellards,** zone supervisor for El Dorado Refining Co., will manage the El Dorado, Kans., office. **Kurvin C. Fish,** formerly El Dorado salesman, has been named Tulsa manager. **William H. Frank,** zone supervisor for Petrofina, will head the Wichita Falls, Tex., office, and **Gene Austin** has been named manager at Des Moines.

William S. Scott, Jr., engineer with Atlantic Refining Co., has been transferred to Jackson, Miss., from Dickinson, N. D.

Joseph C. Gordon, Jr., petroleum engineer with Magnolia Petroleum Co., has been transferred to Hobbs, N. M., from Morgan City, La.

John H. Moore, The Texas Co.'s assistant Rocky Mountain division engineer in Denver, has been promoted to Dallas division engineer.

W. Doyle Miller, president of Miller Petroleum Co., and Dallas and Wichita consultant, has been elected a director of Seminole Oil & Gas Corp. Miller is a former vice president of Dresser Industries, Inc.

K. W. Gilbert, party geophysicist in Lubbock, Tex., for Pan American Petroleum Corp., has been named district geophysicist there. He succeeds **J. D. Novotny,** who has been named division geophysical supervisor in Houston.

Benjamin H. Cooksey, Jr., superintendent of gas measurement in charge of field operations for Hope Natural Gas Co., has been named manager of the gas measurement section, operating department. He succeeds **Charles G. Moorhead,** who has retired.

Ray Butler, production superintendent for Harkins & Co., Alice, Tex., has been appointed superintendent of all drilling and producing operations. He succeeds **George Standard,** who has retired as drilling superintendent. **Wilbur T. Steen,** tool pusher with the company, has been appointed assistant to Butler. Steen will move to Alice from Victoria, Tex.

J. W. Phenicie, formerly assistant division engineer in Houston for Pan American Petroleum Corp., has been named Rocky Mountain division engineer. He succeeds **J. C. McCarthy,** recently named assistant Rocky Mountain division production superintendent. **R. M. Morrow,** staff engineer in Tulsa, has been transferred to Houston to succeed Phenicie as assistant division engineer.

Lord Monckton has been named chairman of the Iraq Petroleum group of companies. He succeeds **Adm. Sir John Cunningham,** who has retired. Walter Turner Monckton before he was knighted in 1937, the new IPC chairman is a distinguished British lawyer who has held a number of cabinet posts in the English Government.

KELLIHER

Thomas G. Kelliher, manager of exploration in Tidewater Oil Co.'s southern division, has been named southern division assistant manager. He succeeds **Lloyd Armstrong,** who was recently elected a vice president. Kelliher joined Tidewater in 1935, and has headquartered in Houston since 1941. He recently took office as president of American Association of Petroleum Landmen.

Harry Mummert, independent operator, has joined Stekoll Petroleum Co. as director of the new production purchasing program. He will headquarter in Fort Worth.

Joseph W. Jackson, Jr., Denver division geologist for Sinclair Oil & Gas Co., has been named division exploration superintendent. He succeeds **C. H. McClure,** who was recently appointed assistant Tulsa division manager.

New research engineers at California Research Corp.'s La Habra, Calif., laboratory are **E. L. Dougherty, T. L. Russell,** and **J. B. Money.** Dougherty was formerly with Dow Chemical Co. Money is a recent graduate of the University of California, and Russell joins the company after receiving a doctor's degree from California Institute of Technology.

Wilbert C. Dennis, chief geologist in Houston for the Lion Oil Co. division of Monsanto Chemical Co., has been named manager of the southern region. He succeeds **Bert E. Gamble,** who has retired after 21 years with the company. Gamble had been southern region manager in Shreveport, La., since 1952. Dennis was regional geologist in Shreveport before moving to Houston last year.

Samuel Strelzoff, general sales manager for Chemical Construction Corp., has been appointed assistant to the president in charge of technical development and sales of special projects. Strelzoff was formerly chief process engineer and assistant chief engineer. **David Fulton,** formerly sales manager of Lummus Co.'s New York division and vice president of Lummus Co. Canada, Ltd., has replaced Strelzoff as general sales manager.

Personals

W. G. Tierney, president of Derby Refining Co., has assumed the duties of **J. P. Moroney,** senior vice president of Colorado Oil & Gas Corp., the parent company. Moroney retired August 15. Tierney will continue as president of Derby and as vice president and a director of Colorado Oil & Gas. **J. W. Meehan,** vice president of Derby, has been elected executive

TIERNEY

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vice president, general manager, and a director of that company. He will continue as president of Derby Oil Purchasing Co. and Jayhawk Pipeline Corp. **L. M. Woodward,** Derby treasurer, has been elected a vice president of Derby. Moroney, retiring vice president of the parent company, joined Colorado Oil & Gas in 1952. He was a vice president and Rocky Mountain general manager for Sinclair Oil & Gas Co. before that time.

C. E. Carlson, superintendent, and **J. J. Casey,** assistant superintendent, of rubber plants at Humble Oil & Refining Co.'s Baytown, Tex., refinery, have retired.

Maarten Voogd, manager of Shell Chemical Corp.'s Torrance, Calif., rubber plant, will retire at the end of this year. He will open offices as a manufacturing consultant in Ojai, Calif.

D. B. Gilmore, Cushing, Okla., consulting geologist, has been named a director and vice president of Great Plains Petroleum Corp., Spokane, Wash. Gilmore will be in charge of development and production. Great Plains has opened a new field office at Cushing.

Edwin F. Peters and **Fred W. Schuessler** have been named senior research scientists at the Whiting, Ind., research laboratories of Standard Oil Co. (Ind.). **Russell V. Malo** has been named senior project chemical engineer, and **Robert M. Ladevich** has been appointed senior project automotive engineer at Whiting.

J. V. Boxell, vice president in charge of North Dakota operations for Calvert Drilling Co., has been transferred to Bismarck, N. D., from Olney, Ill.

T. C. Coleman, tool pusher with Helmerich & Payne, Inc., has been transferred to Beaver, Okla., from Odessa, Tex.

Horace Wright McGee has been named district geologist and supervisor-in-charge of Pan American Petroleum Corp.'s East Texas district, Tyler, Tex. McGee was formerly district geologist in Shreveport, La.

Norman L. Hardwicke, acting group leader in Monsanto Chemical Co.'s high-pressure polyethylene research group, plastics division research department, Texas City, has been promoted to group leader.

Hans C. Jensen, director of transportation planning and programing for Gulf Oil Corp., has been named petroleum transportation and storage specialist in the Office of Oil and Gas of the Interior Department. He succeeds **Earl Ellerbrake,** who has resigned to return to Standard Oil Co. (Ohio).

J. C. Alspaugh, superintendent of the butadiene plant at Humble Oil & Refining Co.'s Baytown, Tex., refinery, has been named general foreman of the butadiene and butyl plants. **A. T. Robertson** has been appointed foreman of finishing and storage at the butyl plant.

J. I. Hastings, Shell Oil Co. geophysicist, has been transferred to Corpus Christi, Tex., from Denver.

W. Ross Moore, formerly with Forest Oil Corp., has opened offices as a consulting geologist in Midland, Tex.

Marvin L. Shapiro, Pan American Petroleum Corp.'s Lubbock, Tex., area geologist, has been promoted to district geologist in Shreveport, La.

Bascom R. Lynn, petroleum engineer with Gulf Oil Corp., has been transferred to Midland, Tex., from Fort Worth.

Dr. Samuel M. Darling has been named research supervisor in the chemical and physical research division of Standard Oil Co. (Ohio). Darling joined Sohio in 1939.

J. E. Rakaskas, district exploration geologist with Cities Service Oil Co., has joined N. Appleman Co., New York, as head of the exploration department. He will headquarter in Wichita.

Francis T. Jones has been transferred by Cities Service Oil Co. from Great Bend, Kans., to Wichita Falls, Tex., where he will be district engineer. **Harold J. Lucchi,** petroleum engineer at Hobbs, N. M., has been named district engineer in Great Bend. **Earl H. Furrey,** Hobbs petroleum engineer, has been named district engineer there.

DEATHS

William Frank Tucker, 78, Tulsa attorney and former director of Savoy Oil Co., died August 9 in a Tulsa hospital. As partner in the law firm of Tucker & Aby from 1905 to 1935, and Tucker & Martin from 1935 to 1955, he was pioneer in the field of oil and gas lease litigation.

Guy A. Tompson, 71, retired president of Bethlehem Supply Co., died August 12 in a Carmel, Calif., hospital of cancer. Tompson retired as president of Bethlehem in January and moved to Carmel from Tulsa. He was vice president of sales and operations for the company before becoming president in 1948. Tompson was at one time a director of the American Petroleum Institute and Independent Petroleum Association of America. He was a member of the executive committee of Mid-Continent Oil and Gas Association and was a member of National Petroleum Council for 1949-50.

Curtis M. Spence, 57, Franklin, Pa., independent producer, died August 7 after a heart attack.

Verne Kenneth Douglas, 62, former superintendent of Mohawk Petroleum Corp.'s Bakersfield, Calif., refinery, died August 6 in Bakersfield.

Markley C. Brown, 63, senior partner in Hillman-Kelley, Inc., Los Angeles supply company, died August 7. Brown was with Jones & Laughlin Steel Corp. before joining Hillman-Kelley in 1935.

Allen F. Cotton, 48, Evansville, Ind., independent, died recently in Goldsmith, Ind.

Low realization ups gasoline yields

BY JOHN C. CASPER
Economics Editor

MID-CONTINENT refiners are paying more for crude and receiving less for refined products than they did in 1956. This two-directional squeeze is one of the reasons for the abnormal shift in yields toward gasoline production.

For the full year 1956, refiners in the Group 3 area averaged about $3.90 a barrel for the basic products from a barrel of crude. The chart shows that realization has increased slightly since the end of April, but the average for the first 7 months was only $3.68.

Realization from a barrel of crude varies among refineries. So, the figures of $3.90 and $3.68 may not represent the actual realization for a particular plant. Calculated realization is based on yields of the major products and average spot prices of these products at the refinery gate.

How Realization Is Calculated

Production of gasoline from crude, excluding the volume due to blended natural gasoline, is credited at the average spot price for regular gasoline. The gallons of kerosine and distillate from a barrel of crude are multiplied by average prices of these products respectively. All other products are credited at the residual price.

Refiners making lubricants, asphalt, coke, wax, and other minor products will have higher realization totals but also will have higher costs. The calculations are designed to show trends in refinery income from products and not actual realization for any special type of plant.

A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,835,075	UP	294,975	UP	87,750
Crude stocks	250,310,000	UP	1,526,000	DOWN	34,062,000
Completions	932	UP	2	DOWN	189
Refinery runs	7,597,000	DOWN	130,000	DOWN	411,000
Gasoline stocks	177,297,000	DOWN	1,418,000	UP	4,324,000
Kerosine stocks	26,306,000	UP	392,000	DOWN	6,248,000
Distillate stocks	124,838,000	UP	4,421,000	DOWN	17,161,000
Residual stocks	67,251,000	UP	364,000	UP	17,113,000
Four-product stocks	395,692,000	UP	3,759,000	DOWN	1,972,000
Total imports	1,531,600	DOWN	122,700	DOWN	148,500

How Much It Dropped

For the first 7 months of 1956, realization averaged about $3.90. It had dropped to $3.68 for the same period in 1958. The reduction in current dollars amounted to $0.22 a barrel or about 5.6%. Meanwhile the wholesale dollar spent for commodities other than farm and food has been devalued until the products are worth only $3.55 in 1956 dollars. The refiner's true income is off $0.35 per barrel of products.

Refiners are paying about $0.25 a barrel more for crude now than in 1956. Corrected for inflation, the increase amounts to about $0.14.

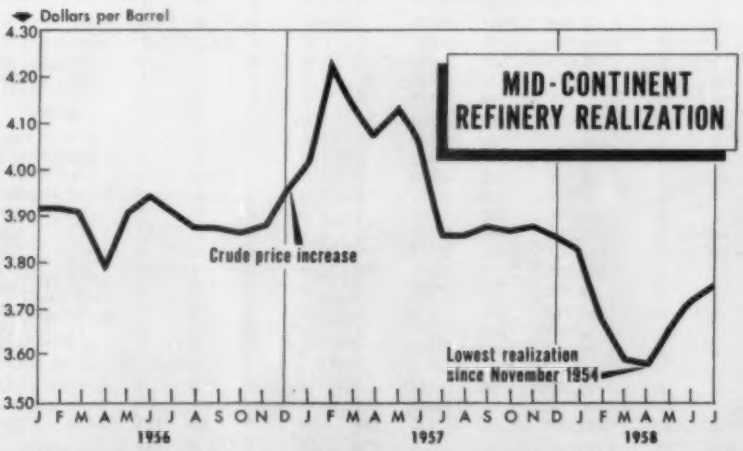
These figures show something of the refiner's plight. He is selling products for $0.35 a barrel less than he did in 1956 and is spending $0.14 a barrel more for crude. His pay for processing has been cut about $0.49 a barrel despite higher labor and equipment costs.

How It Changed Refinery Yields

This income squeeze has influenced the shift toward higher yields of gasoline. In a period of declining prices, the refiner must find some way to maintain his income level. For an individual refiner, the easy way may be a change to higher yields of higher priced products.

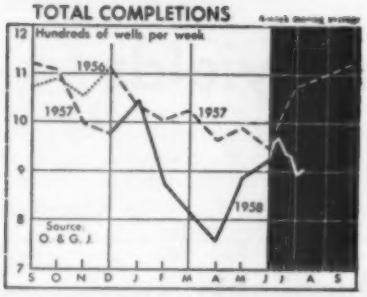
The trouble comes when other refiners try the same plan, and the oversupply of gasoline brings still lower prices. Some refining areas seem to be headed in that direction now.

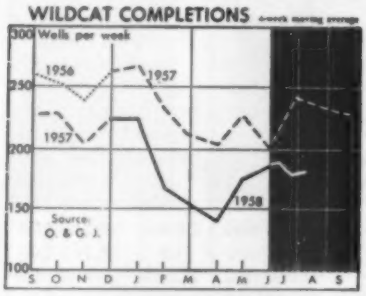
Gasoline prices are declining on the East Coast, particularly in the New England area where tank-wagon quotations are off as much as 1.5 cents a gallon in some areas. There is evidence of some softening of the Group 3 gasoline market.



GROUP 3 REFINERS received $0.22 less for an average barrel of products this year than in 1956. If corrected for inflation, the loss is $0.35.

DRILLING





Active Rotary Rigs*

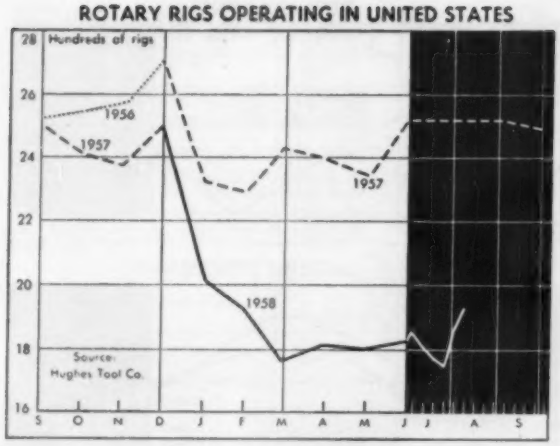
	8-11-58	8-4-58	8-12-57
Alabama	6	6	3
Arkansas	24	25	25
Arizona	....	....	....
California	67	77	112
Colorado	42	47	63
Florida	1	1	....
Georgia	....	....	....
Idaho	....	....	....
Illinois	50	44	46
Indiana	7	5	11
Iowa	3	3	2
Kansas	141	134	155
Kentucky	11	10	13
Louisiana	298	289	424
North	42	43	57
South	216	205	265
Offshore	40	41	102
Maryland	....	....	1
Michigan	12	13	11
Missouri	1	1	....
Montana	21	19	24
Mississippi	41	37	34
Nebraska	28	27	30
Nevada	....	....	1
New Mexico	105	100	170
New York	2	2	....
North Dakota	32	34	31
Ohio	....	....	1
Oklahoma	214	216	278
Oregon	....	1	1
Pennsylvania	11	10	12
South Dakota	2	1	1
Texas	707	652	945
Gulf Coast	155	146	204
Offshore	1	1	4
West	284	261	370
North	214	194	307
East	53	50	60
Tennessee	....	....	1
Utah	29	32	59
Washington	1	....	1
West Virginia	5	4	5
Wyoming	65	61	85
Virginia	....	....	1
Total U. S.	1,926	1,851	2,546
Western Canada	143	139	174
Eastern Canada	2	2	2
Grand total	2,071	1,992	2,722

*Hughes Tool Co.

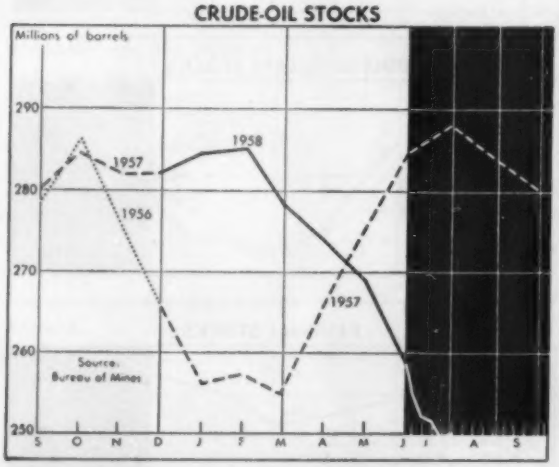
WEEKLY WELL COMPLETIONS . . . WEEK ENDED AUGUST 9, 1958

	Total wells							Cumulative		Total wildcats					Cumulative	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1958	1957	Total	Crude	Cond.	Gas	Dry	1958	1957
Alabama	3	2	0	0	1	0	24,835	45	60	1	0	0	0	1	17	18
Arkansas	22	16	0	0	6	0	54,946	409	646	2	1	0	0	1	99	120
California	28	13	0	3	12	0	180,706	1,011	1,287	10	2	0	1	7	229	322
Colorado	21	2	0	3	16	0	115,597	472	523	16	1	0	3	12	269	353
Illinois	63	39	0	1	23	0	146,918	1,275	1,512	6	0	0	0	6	247	382
Indiana	9	2	0	0	7	0	16,218	440	373	3	2	0	0	1	163	77
Kansas	72	25	0	6	41	0	254,005	2,257	2,530	19	3	0	0	16	479	505
Kentucky	17	6	0	0	11	0	25,345	649	853	1	0	0	0	1	72	172
Louisiana	81	33	4	5	39	0	552,003	2,035	2,301	13	0	1	1	11	289	410
North	37	14	0	5	18	0	145,473	721	813	7	0	0	1	6	107	109
South	36	17	4	0	15	0	350,383	1,044	1,051	4	0	1	0	3	164	248
Offshore	8	2	0	0	6	0	56,147	270	437	2	0	0	0	2	18	53
Michigan	6	2	0	0	3	1	16,275	253	253	2	0	0	0	2	84	95
Mississippi	4	1	1	0	2	0	44,608	233	226	2	0	0	0	2	113	117
Montana	5	4	0	0	1	0	15,609	200	238	1	0	0	0	1	87	85
Nebraska	16	2	0	0	14	0	82,504	419	523	13	0	0	0	13	199	296
New Mexico	52	24	1	15	12	0	241,537	1,187	1,281	9	3	0	0	6	158	168
West	25	7	0	15	3	0	105,826	566	506	3	2	0	0	1	67	62
East	27	17	1	0	9	0	135,711	621	775	6	1	0	0	5	91	106
New York	10	5	0	0	0	5	13,500	345	279	0	0	0	0	0	32	4
North Dakota	12	8	0	0	4	0	81,591	275	169	2	0	0	0	2	91	70
Ohio	25	9	0	3	12	1	54,643	641	652	1	0	0	1	0	8	7
Oklahoma	112	57	1	3	46	5	335,023	3,874	3,760	20	2	1	2	15	550	429
Pennsylvania	0	0	0	0	0	0	0	310	431	0	0	0	0	0	9	36
Texas	328	186	11	16	105	10	1,238,334	10,863	13,306	59	6	3	3	47	2,215	3,305
Dist. 1	20	12	1	0	7	0	40,831	584	759	7	0	0	0	7	237	267
Dist. 2	6	2	0	2	2	0	31,560	453	462	1	0	0	0	1	120	173
Dist. 3	14	2	1	0	11	0	88,724	782	1,077	3	0	1	0	2	173	315
Dist. 4	16	3	2	4	7	0	85,774	728	854	6	0	2	1	3	214	292
East	24	12	6	0	6	0	107,058	742	783	2	0	0	0	2	207	235
Dist. 7-B	52	17	0	4	30	1	132,288	1,460	1,737	21	3	0	2	16	412	626
West	105	82	1	1	18	3	510,907	3,182	3,778	9	3	0	0	6	442	560
Dist. 9	74	46	0	2	23	3	186,602	2,179	2,971	10	0	0	0	10	349	772
Dist. 10	17	10	0	3	1	3	54,590	753	885	0	0	0	0	0	61	65
Utah	11	5	0	1	5	0	63,738	250	120	6	0	0	1	5	53	65
West Virginia	22	3	0	13	5	1	54,863	425	383	1	0	0	0	1	12	19
Wyoming	10	4	0	0	6	0	58,012	429	494	5	0	0	0	5	125	168
Misc. (Alaska, Arizona)	3	0	0	0	3	0	22,387	60	58	3	0	0	0	3	52	41
Total U. S.	932	448	18	69	374	23	3,693,197	28,357	32,258	195	20	5	12	158	5,652	7,264
Prev. week	930	464	16	72	344	34	3,703,307	.....	.....	178	25	2	3	148	.....	.....
Cum. 1958	28,357	13,975	687	2,133	10,848	714	118,411,801	.....	.....	5,652	565	95	175	4,817	.....	.....
West. Canada	51	36	0	7	8	0	276,837	1,476	1,878	5	2	0	2	1	419	537

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	8-2-58	7-26-58	8-3-57
Pennsylvania	2,806	2,816	2,996
Other Appalachian	1,659	1,409	1,540
Illinois, Indiana, and Michigan	10,805	11,004	10,891
Nebraska and North Dakota	2,045	1,897	2,213
Kansas	9,937	9,856	11,150
Oklahoma	15,099	15,145	22,399
Arkansas	1,891	2,061	3,225
Louisiana	16,603	15,859	19,550
North	2,905	2,898	3,875
South	13,698	12,961	15,675
Mississippi, Alabama, Florida	2,349	2,256	2,765
New Mexico	6,150	6,061	9,220
Texas	102,680	102,735	128,558
East Texas	7,013	6,962	9,731
West Texas	50,233	50,590	62,711
Texas Gulf	19,832	19,624	23,603
Other Texas	25,602	25,559	32,513
Wyoming	14,666	14,290	17,900
Other Rocky Mountain	9,798	9,761	6,515
California	37,266	37,542	29,899
Foreign	†16,556	16,112	17,001
Total	250,310	248,784	285,822

*Bureau of Mines. †Includes 5,329,000 bbl. in California.

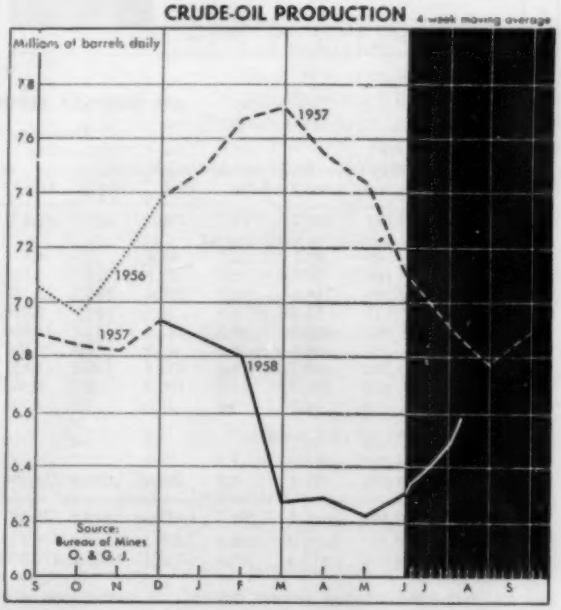
DAILY AVERAGE PRODUCTION FOR WEEK

	August 9, 1958			August 2
	Crude Oil	Lease condensate	Total	total
Alabama	17,100		17,100	17,600
Arkansas	74,400	200	74,600	74,525
California	852,300		852,300	856,300
Colorado	134,000		134,000	133,500
Eastern	47,000		47,000	48,300
Florida	1,275		1,275	1,275
Illinois	230,900		230,900	226,200
Indiana	31,100		31,100	30,600
Kansas	†322,500		†322,500	†327,550
Kentucky	41,900		41,900	41,800
Louisiana	761,450	81,625	843,075	810,875
North	101,950	2,100	104,050	104,825
South	659,500	79,525	739,025	706,050
Michigan	24,700		24,700	24,800
Mississippi	96,600	3,950	100,550	98,200
Montana	78,300		78,300	77,800
Nebraska	56,800		56,800	54,900
Nevada	100		100	100
New Mexico	272,400	5,000	277,400	276,400
North Dakota	36,400		36,400	39,700
Oklahoma	†556,100		†556,100	†567,400
Texas	2,627,000	62,100	2,689,100	2,406,100
Dist. 1	45,000	400	45,400	43,400
Dist. 2	116,000	8,200	124,200	104,600
Dist. 3	345,000	31,000	376,000	358,000
Dist. 4	192,000	8,000	200,000	183,200
Dist. 5	32,000	275	32,275	26,300
Dist. 6	117,000	6,000	123,000	106,200
East Texas field	153,000		153,000	129,000
Dist. 7-B	142,000	75	142,075	125,100
Dist. 7-C	131,000	4,050	135,050	126,150
Dist. 8	1,045,000	1,800	1,046,800	913,900
Dist. 9	204,000	1,500	205,500	186,600
Dist. 10	105,000	800	105,800	103,650
Utah	94,000		94,000	102,000
Wyoming	325,700		325,700	324,000
Others	‡175		‡175	‡175
Total U. S.	6,682,200	152,875	**6,835,075**	6,540,100
Change from previous week, up			**294,975**	
Canada	†448,600		†448,600	†494,700
Total U. S. production—January 1-August 9			1,430,323,625 bbl.	
Same period last year (crude plus cond.)			*1,629,828,014 bbl.	

*Includes 31,111,725 bbl. condensate. †Week ended previous Monday. ‡South Dakota and Washington.

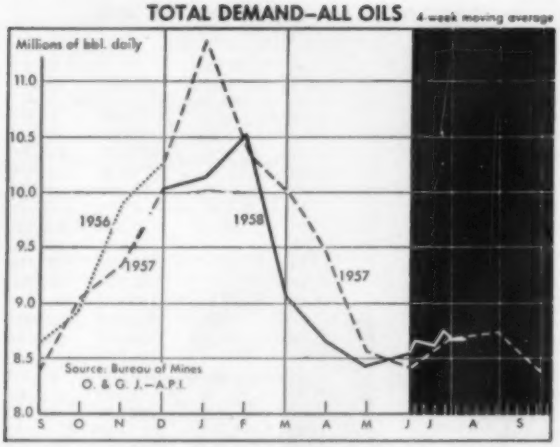
CRUDE-OIL PRODUCTION

4 week moving average

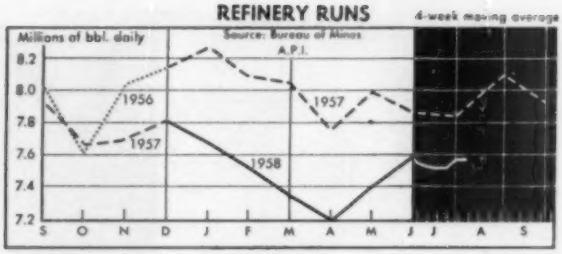


REFINING

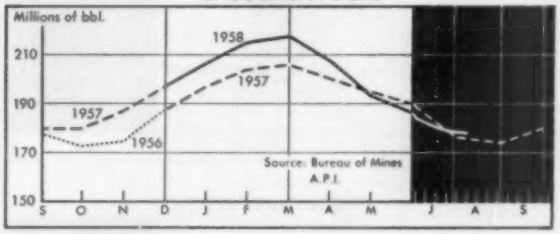
TOTAL DEMAND—ALL OILS



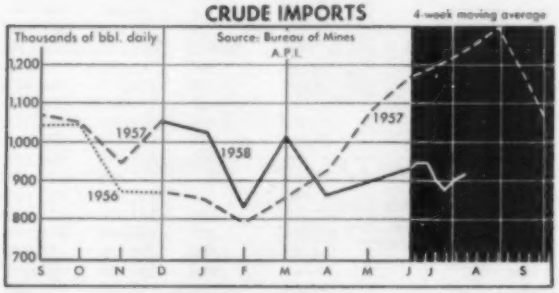
REFINERY RUNS



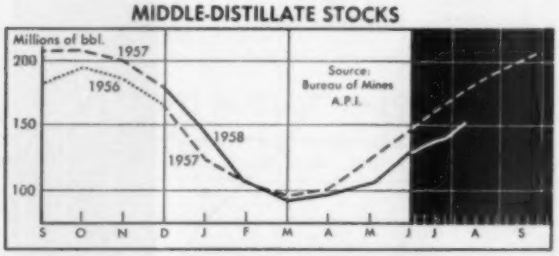
GASOLINE STOCKS



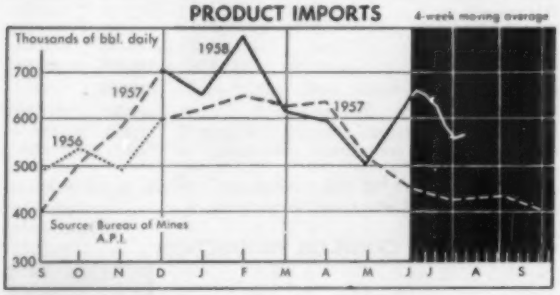
CRUDE IMPORTS



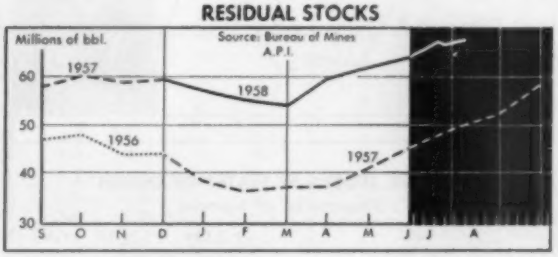
MIDDLE-DISTILLATE STOCKS



PRODUCT IMPORTS



RESIDUAL STOCKS



API REFINERY REPORT, AUGUST 8, 1958

(Thousands of barrels)

District—	Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.	Stocks‡: Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, August 1957: Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist	Resid.
East Coast	1,081	506.2	19.7	276.9	191.7	40,250	9,283	41,581	12,893	1,283	530.9	22.0	334.6	237.7
Appalachian:														
District 1	89	42.2	2.1	19.4	5.7	4,491	540	2,672	546	98	44.7	3.4	21.9	5.4
District 2	104	55.7	3.1	22.1	12.7	2,519	437	1,230	326	68	37.0	2.3	10.3	8.1
Ind., Ill., Ky.	1,380	714.6	50.7	289.4	105.7	33,124	6,564	22,019	5,614	1,332	694.9	52.2	263.3	135.8
Minn., Wis., Dak.	117	53.3	8.9	26.7	15.1	6,728	1,455	6,755	595	105	50.1	7.5	26.7	8.1
Okla., Kans., Mo.	762	428.3	10.1	187.6	31.4	16,809	1,595	12,215	1,067	744	419.0	14.7	165.0	28.2
Inland Texas	257	186.1	7.9	46.1	14.8	6,692	369	1,809	1,994	286	210.6	8.0	52.8	21.3
Texas Gulf Coast	1,792	918.7	74.6	412.1	189.6	22,657	2,760	13,145	8,620	1,917	990.5	92.7	505.2	231.2
La. Gulf Coast	602	375.7	31.7	160.7	42.7	9,302	1,554	5,179	1,483	656	358.3	33.6	168.1	45.4
N. La. and Ark.	99	44.0	5.3	17.0	7.9	4,704	1,069	1,952	169	91	32.2	5.3	19.2	6.8
Rocky Mountain:														
New Mexico	13	10.1	.....	2.6	0.6	379	14	146	55	28	14.9	0.3	4.9	3.7
Other Rky. Mt.	272	125.0	1.7	55.1	31.7	5,241	287	2,980	923	292	141.3	4.2	63.2	36.6
West Coast	1,029	481.4	4.9	160.0	299.1	24,401	379	13,155	32,966	1,192	517.1	5.5	170.6	320.5
Aug. 8, 1958	7,597	3,941.3	220.7	1,675.7	948.7	177,297	26,306	124,838	67,251	8,092	4,041.5	251.7	1,805.8	1,088.8
Aug. 2, 1958	7,727	4,099.0	244.0	1,679.1	1,014.4	178,715	25,914	120,417	66,887	.....	.....	.....	.....	.....
Aug. 9, 1957	8,008	3,971.0	295.4	1,725.3	1,078.3	172,973	32,554	141,999	50,138	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):

★ Regular (89 octane)	11.875-12.25
★ Premium (99 octane)	14.875-15.25

Gulf Coast (cargoes for coastwise or export movements):

Regular (90 octane)	10.75
Regular (92 octane)	11.00
Premium (97 octane)	12.00-12.125
Premium (98 octane)	12.125-12.25

California (rack) (Los Angeles):

Regular (88 octane)	11.3-11.5
Premium (96 octane)	12.8-13.0
Premium (98 octane)	13.3-13.5

Caribbean area (cargoes):

Regular (87 octane)	10.375
Premium (97 octane)	12.125

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:

Grade 26-70	4.5

Breckenridge:

Grade 26-70	4.0

*If 26-70 natural is considered as 100%, prices for lower-vapor-pressure grades increase 2.5% for each unit drop in Reid vapor pressure down to and including 16 lb. Prices for grades below 16 lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):

Kerosine 42-44	9.50
Diesel oil (58 d.i. and above)	9.25
Distillate No. 1	9.25
Distillate No. 2	8.50

Gulf Coast (cargoes):

Kerosine 41-43	8.875
Distillate No. 2	8.625

New York Harbor (barges):

★ Kerosine 41-43	9.95
★ Distillate No. 2	9.45
★ Diesel fuel, 48-52 d.i.	10.05

Caribbean area (cargoes):

Distillate No. 2	8.625

WAX (LB.)

Oklahoma (Group 3):

132-135 A.m.p. (semi-refined) in tank car	6.50

New York (export):

126-130 A.m.p. crude-scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$1.30-1.35
Gulf Coast (cargoes):	
Bunker C fuel	$2.20-2.25
New York Harbor (barges):	
Bunker C fuel	$2.57
Caribbean (cargoes):	
Bunker C	$2.25
California (rack):	
Bunker C fuel, Los Angeles	$2.45

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	23.0
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	20.5
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	22
200 vis. neutral (180° at 100°), 25 p.t.	21

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.§	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour)
14-14.9	$2.36	....	....	....	....
15-15.9	2.41	....	....	....	$1.81
16-16.9	2.46	....	....	....	1.86
17-17.9	2.51	....	....	....	1.91
18-18.9	2.57	....	....	....	1.96
19-19.9	2.62	....	....	....	2.01
20-20.9	2.68	$2.75	....	$2.62	2.06
21-21.9	2.73	2.77	....	2.64	2.11
22-22.9	2.78	2.79	....	2.66	2.16
23-23.9	2.84	2.81	$3.44	2.68	2.21
24-24.9	2.89	2.83	3.46	2.70	2.26
25-25.9	2.95	2.85	3.48	2.72	2.31
26-26.9	3.00	2.87	3.50	2.74	2.36
27-27.9	3.06	2.89	3.52	2.76	2.49
28-28.9	3.11	2.91	3.54	2.78	2.54
29-29.9	3.16	2.93	3.56	2.80	2.59
30-30.9	3.22	2.95	....	2.82	2.63
31-31.9	3.27	2.97	....	2.84	2.67
32-32.9	3.33	2.99	....	2.86	2.71
33-33.9	3.38	3.01	....	2.88	2.75
34-34.9	3.44	3.03	....	2.90	2.79
35-35.9	....	3.05	....	2.92	2.83
36-36.9	....	3.07	....	2.94	2.87
37-37.9	....	3.09	....	2.96	2.89
38-38.9	....	3.11	....	2.98	2.91
39-39.9	....	3.13	....	3.00	2.93
40-44.9	....	3.15	....	3.02	2.95

*Includes Oklahoma (sweet), part of Kansas, North Dakota, West Texas (sweet). †Low cold test crude. ‡Sour. §Some postings 3-11 cents lower.

Effective dates of broad changes: California, 6-22-58; east of California, January 3-10, 1957; Pennsylvania Grade, 6-18-58.

FLAT PRICES

Louisiana:	
Bienville (distillate)	$3.05
Ville Platte	3.45
Texas:	
East Texas	3.25
Conroe	3.53
Van	3.08
Pennsylvania Grade:	
Bradford	3.90
Middle District	3.72
Southwest Pennsylvania	3.43
West Virginia	3.25
Buckeye Grade	3.25
Illinois Basin	3.00
Canada:	
Leduc-Woodbend	2.67
Redwater (Alta.)	2.56
Smiley (Sask.)	2.33
Pembina	2.52

FOREIGN

Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	3.75
San Joaquin, 41°-41.9°, Puerto La Cruz	3.34
Oficina, 35°-35.9°, Puerto La Cruz	3.05
Tia Juana medium, 26°-26.9°, Amuay*	2.55
Quiriquire, 16.0°-16.4°, Caripito	2.30
Lagunillas heavy, flat, Amuay or Las Piedras*	2.25
Bachaquero, flat, 15°-16°, Las Piedras*	2.08

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$2.12
Iranian, 34.0°-34.9°, Bandar Masur	2.04
Iranian, 34.0°-34.9°, Abadan	1.99
Iraq, 35.0°-35.9°, Fao	1.98
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.85
Qatar, 41.0°-41.9°, Umm Said	2.23
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.49
Iraq, 36.0°-36.9°, Tripoli, Banias	2.49
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°	2.75

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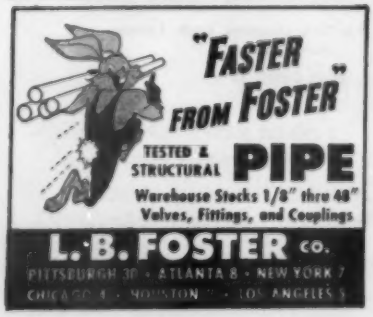
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Send complete and detailed resume, snapshot, and salary requirements to Box K-786, The Oil and Gas Journal, Tulsa, Oklahoma.

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With 7 or more years experience in operations and economics required for overseas position with American firm advising local government on initial operation of new refinery. Good climate, excellent family living conditions, attractive salary. No foreign language requirement.

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Excellent opportunity for Chemical Engineer who is willing to assume responsibilities. Minimum of 5 years plant operating experience.

Work will be to assist with plant operations such as catalytic cracking reforming, de-sulphurization, atmospheric and vacuum distillation, polymerization, asphalt, wax, etc.

Box K-834, The Oil and Gas Journal, Tulsa, Oklahoma.

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Man with minimum ten years experience in sales and service of leasehold tanks and related equipment to head up sales of these items in large, growing organization, location Mid-Continent. All replies strictly confidential. Send detailed resume, snapshot, and salary expected to

Box K-809,
The Oil and Gas Journal,
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Box 31 J 334,
The Oil and Gas Journal,
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SITUATION WANTED

GEOLOGIST, 32, M.S. Caltech, special studies in sedimentation wants position as petroleum geologist. Eight years varied domestic engineering experience with major company in development drilling operations, property evaluations, subsurface studies. Box 31 J 282, The Oil and Gas Journal, 4041 Marlton Ave., L.A. 8, Calif.

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WATER FLOOD ENGINEER: 7 years petroleum engineer, secondary recovery, field superintendent. Mid-Continent. Age: 33. Presently employed. Box K-823, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGICAL ENGINEER, 30, six years experience as petroleum geologist, northern Rocky Mountain area and western Washington—surface, subsurface, well-site, administrative and consulting work. Available immediately, northern Rocky Mountain area or foreign country. Box K-815, The Oil and Gas Journal, Tulsa, Oklahoma.

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GEOPHYSICIST, B.S., 31, 6 years experience with Major Oil Company. Interpretative work in New Mexico and Louisiana offshore. Box K-821, The Oil and Gas Journal, Tulsa, Oklahoma.

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FOR DRILLING DEALS in Texas, contact Ogden Oil Company, P. O. Box 464, Ph. EL 2-3352, Taylor, Texas.

OIL AND GAS LEASES—16,434 acres one tract located Catron County, New Mexico. Major oil companies hold surrounding acreage. Submit best offer. Write James LeRose, Longhorn Drilling & Exploration, 12315 S. Lowe Avenue—Chicago 28, Illinois.

FOR QUICK SALE: ¾ working interest, price $375 per ⅛ to drill shallow Dutcher well in near future on 80 acre lease with locations staked by geophysical survey between two producing pools. Plat & details, L. Snavely, Geologist, Box 315, Coweta, Okla.

PRINCIPALS with unlimited funds seek any-sized oil-gas production. Give details; strict confidence. Box K-774, The Oil and Gas Journal, Tulsa, Oklahoma.

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U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D. C. Notice is hereby given that a parcel containing 160 acres described as the SW¼NW¼ Sec. 19, T. 9 N., R. 27 W., S½SE¼, SE¼SW¼; Sec. 13, T. 9 N., R. 28 W., 5th P. M., Arkansas, within the known geologic structure of Cecil Field will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 1 P. M., E.S.T., August 27, 1958 when bids will be opened. Details of the lease offering, how and where to submit bids, may be obtained from the Bureau's Eastern States Land Office, Washington 25, D. C., H. K. Scholl, Manager, Eastern States Land Office, Washington 25, D. C.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Land Office, Cheyenne, Wyoming. Notice is hereby given that approximately 3,196.77 acres of land in 39 parcels within the known geologic structures of a number of fields in Big Horn, Park, and Weston Counties, Wyoming, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre **through sealed bids** on or before September 17, 1958, when bids will be opened. Details of the lease offering, and how and where to submit bids, may be obtained from the Land Office, Cheyenne, Wyoming. Craig A. Decker, Manager.

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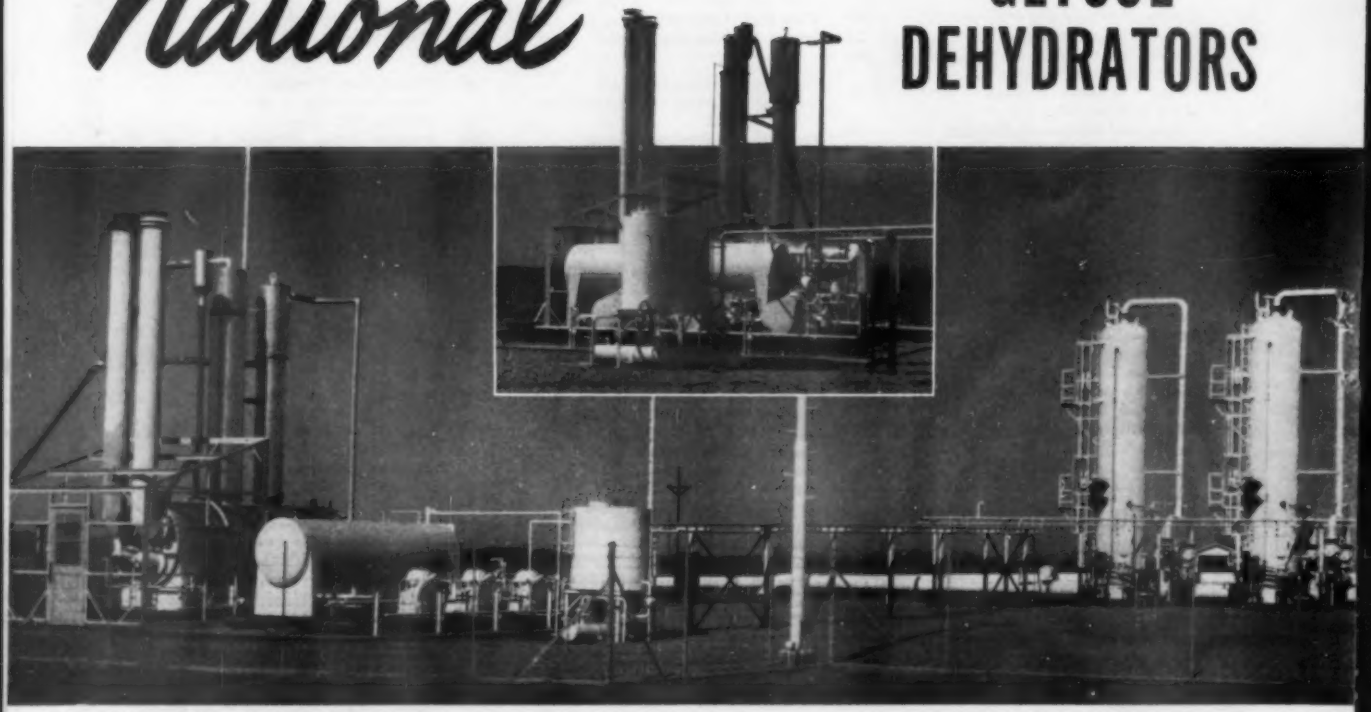

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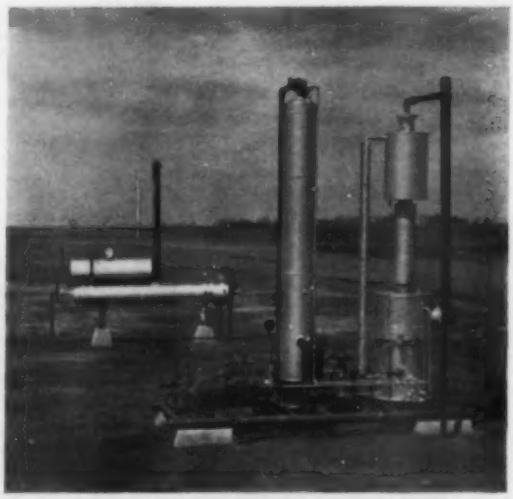

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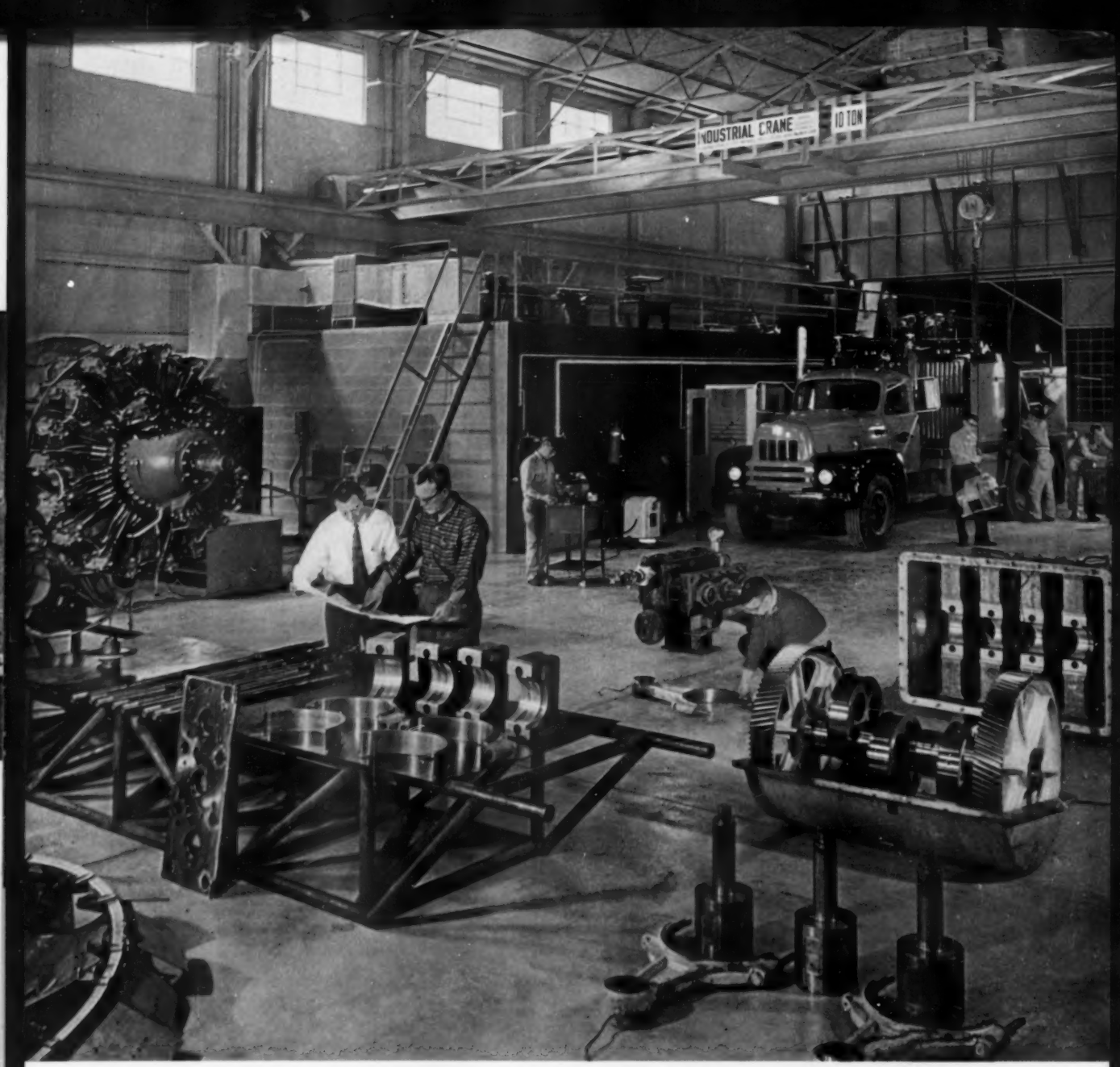

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